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Active Capacity Increasing

At Corporation Plants—Independents Also Increase Production—Important Wage Controversy

Steel Corporation activities continue to increase and its production now represents 64 per cent of ingot capacity compared with slightly less than 60 per cent a week ago. Independents are also increasing production, but improvement is not regular. The action of members of the Amalgamated Association in rejecting the proposed wage reductions in sheet and tin plate mills as submitted by officers of the association after conference with employers is expected to result in serious complications.

Railroad Buying

The aggressiveness of the Algoma Steel Corporation, Sault Ste. Marie, Ont., in endeavoring to obtain rail business in this country is becoming an increasingly important factor in the rail market. The Canadian company was the successful bidder on 4,000 tons for the Hocking Valley, although it was understood that the officers of that railroad were considering the advisability of paying a higher price and placing the rails with American mills. The C., H. & D. has placed 4,000 tons with the Carnegie Steel Co. Car orders of the week total about 1,700, of which the largest were 750 stock cars placed by the Union Pacific with the Haskell & Barker Car Mfg. Co., and 700 box cars placed with the same builder by the Santa Fe. The Pressed Steel Car Co. has taken 200 tank cars additional for the Santa Fe.

Plates

Some of the eastern shipbuilding yards now have so many orders for new boats on their books that they have been compelled to decline offers for more vessels during the past few days. The Carnegie Steel Co. has booked 9,000 tons of steel, including 6,000 tons of plates, for the Fore River Ship Building Co., and the Carnegie company and Coatesville mills will supply the shapes and plates for the Standard Oil Co. boat, to be built by the Newport News company. In the bidding on the steel for the battleship California, the Worth Bros. Co. is lowest on 9,400 tons of plates.

Machinery

The machine tool market in the east during the past week has been very active and a large number of orders, principally for export, were booked. Manufacturers are now figuring on contracts for war materials which, if placed, will still further stimulate the machinery market. Cincinnati manufacturers of lathes continue to receive many orders, but Pittsburgh and Chicago are not enjoying much improvement in machinery business.

Ferro Manganees

The ferro-manganese situation is becoming more serious owing to the difficulty in importing the alloy. A sale of 200 tons for prompt delivery has been made to an Ohio company at $100 per ton, Pittsburgh, an advance of $32 over the recent nominal quotation.

Structural Materials

Inquiries for structural material in some parts of the country are more numerous, but not many awards are being made and the tonnage is not heavy. There is keen competition for fabricated work and it is not certain that the 1.15c, Pittsburgh, price on plates for delivery in March can be maintained. It is understood that 19,000 tons for grade crossing work at Indianapolis will probably be divided between two Pittsburgh companies.

THE OPEN HEARTH

The People Going Home

COMMON sense, said Emerson, is the most uncommon thing in the world. That was true when the sage of Concord lived and during the past few years the ability to see things clearly, with freedom from passion and prejudice, has seemed to be even more rare.

But the greatest thing about the American people is that, though they are impulsive and are at times swayed by the appeals of the demagogue and fanatic or allow righteous indignation to carry them too far, they always get back to and stand squarely upon the solid rock of reason.

"I am going home," recently said a prominent Ohioan, who had been carried away to strange pastures by the false reasoning of agitators. He was homesick. He was going back to sound principles.

The American people are going home. Some of those who have complained the most, and often with justification, are leading the procession. Writers like Miss Tarbell are finding that business men are like other good folks in really believing in the golden rule and in wishing to live up to it. Possibly they needed help in applying that rule, but now they more plainly see their duty to the other fellow and are anxious to do it.

The courts are also pointing the way on the homeward journey. They are erecting milestones that will stand the test of time. For example, the other day the United States district court at New York dismissed the government suits against the so-called shipping trust. The decision, of which an extended report is published elsewhere in this issue, was written by Judge Lacombe, and three other judges concurred. Stripped of all legal verbiage, it says that so long as companies are not guilty of unreasonable and unfair conduct, but treat all men alike as nearly as possible, they shall not be condemned. If they unite or co-operate to advance their own interests without infringing upon the rights of others, or if they act jointly to bring about more satisfactory conditions for themselves and their customers, they are to be commended. Nor are they required to ignore the customs of the ages. Special concessions may be made to those giving the largest amounts of business, providing these concessions are uniform and not secret. This custom, says the court, is probably as old as trade itself.

Judge Lacombe says, however, that the steamship lines must not refuse to accept cargoes at regular rates unless good cause can be shown. Hence the court grants an injunction to prevent such refusal.

All of this is simply getting back home. Perhaps the old home is tidied up a bit, but it is the old home and the people are going to it to stay.

Home, Sweet Home!

This going home means to live in peace and harmony; it means an end of vituperation; it means the establishing of reason on a throne of justice; it means happiness and prosperity for the American people.

What It Might Do

THE assertion made by President Wilson, at Indianapolis, about a month ago, that the federal trade commission had been provided ample power to bring about the scientific adjustment of the tariff, was a surprise even to the author of the clause on which the President based his claim of power to deal with the tariff. The man who wrote the paragraph known as the paragraph H of section 6 was Representative Stevens, of Minnesota, who, after the President made his Indianapolis speech, said to the Washington correspondent of THE IRON TRADE REVIEW that the question as to the federal trade commission acting as a tariff board was never discussed in connection with the bill creating the commission.

Up to the present time, no member of the President's own party has arisen to deny the correctness of Mr. Stevens' statement. But even if it had been intended that this clause should authorize the commission to act as a tariff board, the result would not have been satisfactory for several reasons which we shall not now discuss. This clause does, however, give the federal trade commission power to render highly important service, as is clearly

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pointed out by S. E. Eldridge in an article published on another page of this issue. The commission will be able to make investigations as to foreign conditions, especially as they affect the foreign trade of the United States, and it ought also to be able to report to congress recommendations which will result in the enactment of legislation to permit manufacturers to unite in extending their foreign trade.

President Wilson, in a speech at Washington recently, in discussing opportunities for foreign competition, said: "What I would like very much to be shown is a method of co-operation which is not a method of combination. * * * * I want to know how co-operative methods can be adopted for the benefit of everybody who wants to use them and I say frankly that if I can be shown that, I am for them." Let us hope the federal trade commission will be able to tell the President how to bring about the desired results.

The Silver Lining

THE period of severe business depression of 1914-15 will go down in history as one of the most distressing in the history of the country. Let us hope that never again will the United States pass through a period when so many thousands of worthy men are unable to obtain work. The period will also be remembered, however, as the one in which, to a greater extent than ever before, systematic, intelligent efforts were made to provide work for those who had been forced into idleness. Manufacturers who remember the depression of 1893 and some other periods in which there was great financial and industrial distress declare that in past years all kinds of manufacturing plants were closed with very little thought as to the welfare of the employes, who were simply turned out to shift for themselves. True, soup houses and other charitable means of preventing starvation were resorted to, but to a large extent these forms of relief did harm, for they robbed the beneficiaries of self-respect.

For months past, as shown in the reports published elsewhere in this issue, there has been persistent effort to give as much employment as possible, even when by so doing employers suffered financial loss, and when in spite of all efforts, many were without work, funds were raised by public subscription to provide jobs. In this way, thousands have been given work, have retained their self-respect and have been given a better opinion of their fellow men.

The silver lining of the dark cloud of depression this winter is the spirit of intelligent helpfulness that has developed.

A Preposterous Proposition

THE extent to which union labor will go in making demands is illustrated by the demand that the United States shall pay the fines and costs assessed against the boycotting members of the hatters' union in the Danbury case recently decided by the Supreme Court of the United States. The servility to unions of some members of congress is also illustrated by the willingness of at least four members of the Connecticut delegation to introduce a bill providing for the payment out of the United States treasury of $290,000 which the court has declared must be paid by the members of the union who carried on the boycott in an attempt to ruin Mr. Loewe's business.

It is difficult to treat this subject with patience or seriously. We do not believe that the proposed bill will receive serious attention of congress. If members of the union are likely to endure any hardship, it is because they did the bidding of the union. The Danbury case was fought to a finish in order to determine whether men have a right to carry on a boycott. The entire American Federation of Labor, as well as other labor bodies, was interested in the result. If, as we have previously stated, the federation of labor was willing to put up hundreds of thousands of dollars to defend the dynamiters at Indianapolis and Los Angeles, it ought also to be willing to come to the rescue of the men who have been guilty of nothing but carrying out the union boycott policy in Connecticut. In fact, there is excellent authority for the belief that the union guaranteed the hatters that they would not suffer by reason of defending the suit, but, of course, the union will not go into its treasury if Uncle Sam can be persuaded to foot the bill.

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for February, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for Jan., 1915.	Average for Nov., 1914.	Average for Feb., 1914.
Bessemer pig iron, Pittsburgh..	$14.55	$14.70	$14.70	$15.09
Basic pig iron, Pittsburgh.....	13.45	13.45	13.45	14.09
No. 2 Fdy. pig iron, Pittsburgh	13.70	13.70	13.70	14.09
Northern No. 2 Fdy., Chgo....	13.00	13.00	13.00	14.25
Lake Superior Charcoal, Chgo..	15.75	15.75	15.75	15.50
Malleable, Bessemer, Chgo.....	13.00	13.00	13.00	14.25
Southern No. 2, Birmingham...	9.50	9.50	9.50	10.50
Southern Ohio No. 2, Ironton..	12.75	12.75	12.63	13.00
Basic, eastern Pa.....	14.00	13.50	13.50	14.25
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.75
No. 2X Foundry, Philadelphia..	14.25	14.25	14.25	15.00
Ferro mang., Balti.....	100.00	68.00	68.00	38.00
Billets, Pbgh.	20.00	19.50	19.00	21.00
Sheet bars, Pbgh.....	20.50	20.00	19.62	22.00
Steel bars, Chicago.....	1.29	1.29	1.25	1.38
Steel bars, Pittsburgh.....	1.10	1.10	1.10	1.20
Iron bars, Philadelphia.....	1.15	1.15	1.12	1.27
Iron bars, Cleveland, local del'y.	1.15	1.15	1.20	1.30
Iron bars, Chgo. mill.....	1.02½	.98	.98	1.20

	Today's prices.	Average for Jan., 1915.	Average for Nov., 1914.	Average for Feb., 1914.
Beams, Chicago	$1.29	$1.29	$1.25	$1.38
Beams, Pittsburgh	1.10	1.10	1.11	1.20
Beams, Philadelphia	1.25	1.25	1.20	1.30
Tank plates, Pittsburgh.....	1.10	1.10	1.09	1.20
Tank plates, Chicago.....	1.29c	1.28	1.25	1.38
Tank plates, Philadelphia.....	1.25	1.25	1.20	1.30
Sheets, blk., No. 28, Pittsburgh	1.80	1.80	1.89	1.94
Sheets, blue an., No. 10, Pbgh..	1.30	1.30	1.39	1.40
Sheets, galv., No. 28, Pbgh....	3.25	2.77	2.86	2.94
Wire nails, Pittsburgh.....	1.60	1.51	1.59	1.59
Connellsvile fur. coke contr....	1.65	1.69	1.65	1.92
Connellsville fdy. coke, contr...	2.25	2.25	2.25	2.50
Heavy melting steel, Pbgh.....	11.75	11.55	10.06	12.37
Heavy melting steel, east'n Pa.	10.50	10.00	9.50	11.50
Heavy melting steel, Chgo.....	9.00	8.87	8.25	10.00
No. 1 wrought eastern Pa.....	12.00	12.00	11.50	14.00
No. 1 wrought, Chgo.....	8.75	8.80	7.50	9.44
Rerolling rails, Chgo.....	9.50	9.50	9.50	11.19
Car wheels, Chgo.....	10.00	10.00	10.00	11.75

(For Additional Prices See Page 398.)

Large Tonnage Sold in the East

Where Users of Basic and Pipe-Making Grades of Pig Iron Place Orders—Market Dull in Some Centers—Prices Show Little Change

Philadelphia, Feb. 15.—Several important transactions in basic and pipe-making grades have swollen considerably the big iron sales in this territory the past week and the total volume was the heaviest in a number of weeks. A Harrisburg steel works closed for 10,000 to 15,000 tons of basic for forward delivery dividing the business among two or three makers, one of whom is understood to be a southern producer. The price was $14.25 delivered or 50 to 75 cents higher than the last sale, but some special conditions were present in this transaction. Basic makers are disposed to hold $14 delivered eastern Pennsylvania as their present minimum. There is no active inquiry for this grade pending at present. Increased melt by the cast iron pipe works as the result of better orders, is producing more buying of low grade iron by these interests. A Bristol, Pa., consumer has closed for 1,000 to 2,000 tons of northern forge and No. 3 for early shipment, at $13.50, delivered, the business going to several eastern and central Pennsylvania makers. Other tonnages have been sold to other pipe works and there are rumors of round lots having been taken for outside plants. Ordinary foundry grades remain slow. An inquiry for 500 tons of No. 2X for third quarter is pending. The Philadelphia market for No. 2X is unchanged at $14.25 to $14.50. Sales of about 500 tons of Virginia on the basis of $12.75 furnace for No. 2X are reported. Some Virginia sellers still will accept freely $12.50 furnace. The Oriskany furnace at Lynchburg has been blown in, making four Virginia stacks in operation. Sales of standard low phosphorus, by sellers in the territory totaled in the week about 1,000 tons at unchanged prices. Eastern makers have made further quotations on hematite or special bessemer for export, but their efforts are blocked by the high freights.

Foundry Iron Shipments Increasing

Pittsburgh, Feb. 16.—Several manufacturers of foundry pig iron grades in western Pennsylvania and eastern Ohio have experienced a substantial increase in demand this month, some furnace owners saying shipments the first two weeks of February exceed those of the corresponding period in January by at least 50 per cent. There has been no increase in new demand, however, and prices have not strengthened. Steel making grades continue to peg along at the gait established last month. Bessemer pig iron, in small lots, has been offered at $13.60, valley, for immediate delivery. Steel works have increased blast furnace operations slightly this month. The Carnegie Steel Co. is blowing 34 out of 59 stacks; the Cambria Steel Co., six out of eight stacks; the Jones & Laughlin Steel Co., five out of ten; the Republic Iron & Steel Co., five out of seven stacks in the valleys, and the Youngstown Sheet & Tube Co. is operating two of its four furnaces, but will blow in an additional stack this week.

Satisfactory Shipments

Cleveland, Feb. 16.—Reports from furnaces along the lakes, including Detroit, Toledo, Cleveland and Buffalo, show that shipments are going forward from nearly all stacks at a satisfactory rate. At Detroit particularly the movement is active and shipments are exceeding the make. In the immediate Cleveland district, some foundries have increased their melt by a large percentage, but others report very little improvement. Sales are few and of very light tonnages.

Two Melters Buy.

Cincinnati, Feb. 15.—The Jeffrey Mfg. Co., Columbus, O., has purchased between 500 and 1,000 tons of low phosphorus iron, and another manufacturer in Central Ohio territory is asking for 500 tons of high phosphorus iron. The Lunkenheimer Co., this city, has also taken about 450 tons of foundry iron.

(For complete prices see page 398.)

These mark the extent of transactions in the pig iron market during the past week. Conditions today show very little change from those at the first of the year, and the situation could still be considered to be very slow as far as new sales and inquiries are concerned. Shipments on old contracts are going forward in a satisfactory manner and more iron is being shipped now than at any time during the last half of 1914. A small amount of inquiry has come out for shipment over the last half of 1915, but makers are slow to quote for this delivery. Southern No. 2 foundry iron is quoted at from $9.50 to $10, Birmingham basis, and southern Ohio No. 2 foundry at from $12.75 to $13, Ironton basis, both for first half shipment. Silvery iron is quoted at from $16.26 to $16.76, Cincinnati, for 8 per cent silicon.

Inquiries Stimulate Market

St. Louis, Feb. 15.—The pig iron market here has been stimulated somewhat by the following inquiries: Northern, 500 tons, 200 tons of 40 per cent silicon, second quarter delivery; southern, 300 tons, second and third quarter delivery. Southern No. 2 is quoted at $9.75 to $10, Birmingham basis, but some agents insist that a $9.50 price could be made. Northern iron is held at $13, Chicago and Ironton furnaces.

About the only bright prospect is the fact that a number of East St. Louis plants, together with the Bridge & Beach Mfg. Co., St. Louis, are starting up with increased forces. H. C. Honer, vice president of the Bridge & Beach plant, says the plant, which has been shut down since Dec. 17, has given employment to 350 men, and will keep running full force unless the unforeseen happens.

Better Tone at Buffalo

Buffalo, Feb. 16.—Furnaces of the Buffalo district report an improvement in the inquiry for iron of the various grades over the past week or ten days. Added to this is a general betterment of tone. Specifications against contracts continue to come forward and a corresponding fair volume of shipments is being made by the producers.

Scattered sales of small tonnages seem to be the rule at present. One order was booked for 500 tons of low silicon iron at $13.25, f. o. b. furnace, showing the firmness of prices. This was the largest order of the week. The other sales were in lots not to exceed 100 to 200 tons.

Prices remain at the level quoted a week ago.

The Buffalo Union Furnace Co. finding the demand on its two operating stacks exceeding their capacity, blew in its furnace B the last of the week. The company is now operating all its furnaces and has sufficient business booked ahead to keep them in commission for a number of months. This means that all of the merchant stacks in the city of Buffalo are in blast.

Improvement in South

Birmingham, Ala., Feb. 15.—For the first time in weeks, it can be said that there is in sight some real improvement in the Birmingham pig iron market. There has been a noticeable increase in inquiry and the furnace interests in general are more hopeful than at any time for months.

One company has already sold its entire make for the current month, which is about 20,000 tons. An order has been placed for export to England by the Sloss-Sheffield company, according to Col. J. C. Maben, president, which calls for 6,000 tons.

No stacks have been blown in or any material changes in conditions realized, but the reports of new stacks blown in by the Steel Corporation and similar news have engendered a better feeling.

The larger part of current business, it is understood is being done at $9.75, No. 2 foundry, Birmingham. Quotations still range from $9.50 to $10.

Chicago Iron Market Quiet

Chicago, Feb. 16.—Inquiry for pig iron in the Chicago market seems to have lessened and some sellers experienced a decided falling off during the present week from the volume which marked the preceding week. Up to Feb. 13, sales had been unusually good although not for unusually large tonnages.

Prices for northern No. 2 foundry and malleable, while not strong, have been maintained at $13, Chicago furnace, with closer attention paid to premiums for high silicon than was the case during early winter.

Foundries appear to be melting a larger tonnage than for some time, but inasmuch as most foundries have a considerable supply of iron on their yards or already under contract, this increase has not yet made itself felt materially in the way of new buying. Sellers of foundry coke find demand for this product increasing steadily and this gives some insight into the tonnage being melted. That the total of pig iron now on books is not large is evidenced by the fact that no idle furnaces are being put in blast, sellers evidently feeling certain they can handle their obligations with the present active capacity.

Southern iron continues quiet with prices ranging from $9.50 to $10, Birmingham, which is not low enough to compete successfully with present prices on northern iron in this immediate vicinity.

There is no change in the situation as to charcoal iron and one active stack in Michigan is about to go out of blast in view of the small demand for this product.

More Inquiry in New York

New York, Feb. 16.—Some further broadening of the inquiry for pig iron is to be noted in this district the past week. Pending inquiries for domestic buyers, a large portion of which are being quietly figured, aggregate 8,000 to 10,000 tons. Most of this metal is for first half shipment. A railroad equipment maker is asking 800 tons of foundry for a southern delivery. Another equipment builder took 500 tons of foundry. Prices still range around former levels at tidewater, or $14.25 to $14.50 for No. 2X, but certain brands of Buffalo iron have been offered in this territory at considerably below $13, furnace, the open price. In New England, as previously stated, recent quotations named by various sellers have been considerably less than $13, Buffalo equivalent, some of which came from Pennsylvania makers.

More Activity

Of Steel Corporation Plants—Maryland Steel Co. Increases Output

New York, Feb. 17. (By wire.)—The United States Steel Corporation's operations are still rising and this week are at 64 per cent of ingot capacity compared to less than 60 per cent last week. The general situation is more encouraging.

The Maryland Steel Co. will start about March 1 its bessemer and open-hearth plants, its rail mill and will put on additional blast furnaces. It has a good accumulation of rails. The steel works and mill have been idle several months.

The public service corporation, New Jersey, has received bids for 1,500 tons of rails which are expected to go to the Bethlehem Steel Co.

The Burlington awards the American Car & Foundry Co. 2,500 center sills for the Colorado & Southern. The Burlington cars are still pending. The Boston & Maine asks 3,000 underframes for delivery over two and one-half years. The Santa Fe has out a new inquiry for 500 refrigerator cars. The Reading has placed 15 coaches with Harlan & Hollingsworth.

(*For complete prices see page* 398.)

Makers of Steel Bars

Pleased by Satisfactory Specifications and Continued Firmness of Prices—Not Much New Business

Philadelphia, Feb. 15.—Makers of steel bars find encouragement in the recent specifications against contracts in this territory which while not heavy are satisfactory in view of conditions. With some mills, the past week in this respect, was ahead of other recent similar periods. Not a large amount of new business is moving, but some fair sized inquiries are pending, a few of which are for export. An inquiry for 1,000 to 2,000 tons for export reported last week and which still is open, has been followed by another lot of 300 tons from Philadelphia merchants. Business in reinforcing bars is coming out a little better. One order for 225 tons for a Baltimore buyer has been closed and an inquiry for 400 tons for a Philadelphia contractor is out. A sedimentation basin at Tarresdale, Pa., for the city of Philadelphia, which was contracted for this week, will require some reinforcing bars and steel sheet piling and a considerable tonnage of bars also will be needed for the new Cumberland Valley railroad concrete bridge at Harrisburg, which will be a mile in length. Prices remain at 1.25c, Philadelphia, for February, 1.30c for March and 1.35c for second quarter or 1.10c, 1.15c and 1.20c, Pittsburgh, respectively.

Steel Bars Steady

Chicago, Feb. 16.—The situation in steel bars presents no new features, although advanced quotations are steady and specifying on existing contracts is being done in gratifying volume. It is a fact that most of the larger users have covered their requirements to April 1 at 1.29c, Chicago, and practically no new contracts are being taken for March on the basis of 1.34c, Chicago, which has been announced as the price for that month. Makers of bars find tonnages increasing and works operations are being speeded up to meet this condition, but the balance between orders and operations has not yet been struck. What little new business is being placed is on the basis of 1.29c, Chicago, for delivery immediately.

Steel Bars Firm

Pittsburgh, Feb. 16.—The market for steel bars shows no change in position. Specifications are coming out at a fairly satisfactory rate and there has been some new buying this month. Prevailing prices appear firm. Iron bars are quiet; common iron bars have sold as low as 1.10c recently in this district.

Bar Iron More Active

Cleveland, Feb. 16.—Specifications from automobile manufacturers and other users of bars are satisfactory and consumers report gradual increase of business. The price schedule is being maintained, but there is very little buying. Bar iron is somewhat more active and both the Union and Empire rolling mills will be in action next week. The Union is active this week, but the Empire is idle. The bar mill of the Upson Nut Co. is working full capacity. At its steel plant, four of the five open hearths are active.

Bar Iron Advances

Chicago, Feb. 16.—Increasing tonnages on mill books have added considerable strength to the bar iron market and the advance to 1.07½c, Chicago, made early last week, has been maintained without difficulty. A further advance to 1.10c, Chicago, has been made today by one maker. Bookings are increasing and the price of bar iron is too low for comfort even at this level. Mills are running on better schedule than has prevailed since early last year and the backlog in every case is accumulating. Buyers are more and more eager to cover their requirements while at the same time mills are refusing to contract for more than 60 days in advance.

Demand Increasing

Buffalo, Feb. 16.—The demand for bars under contract is increasing and in some instances has reached the urgent stage. One agency reports that users are asking for immediate delivery on bars booked for deliveries from March 1 to 10, having apparently consumed their current quotas.

Hoops, Bands, Shafting

Pittsburgh, Feb. 16.—The Carnegie Steel Co. is quoting steel hoops at 1.30c, or $1 a ton above the previously prevailing quotation. Several other makers have withdrawn figures below that level this week. Bands are offered at prices provided by the bar steel card. Specifications for both products this month have exceeded those received in the corresponding period in January. Cold rolled shafting reflects moderate strength, but there is no change.

Wabana Mines Resume

After Being Idle Several Months—Active Inquiry for Manganese Ore—Cuban Development

New York, Feb. 16.—Reports from Newfoundland state that the Wabana iron mines there, which have been idle for several months, have resumed operations. None of this ore has been offered recently to eastern buyers. Owing to the curtailment of shipments to the United States, to Germany and to England, in connection with the reduced consumption in Canada, a considerable stock of ore has been accumulated at the mine and this still remains. There have been no further developments in the offering of foreign ores in the eastern market.

There continues an active inquiry in this country for manganese ore for export. Cuban operators whose holdings embrace some deposits of manganese ore running about 40 per cent in manganese natural, and 45 per cent dried, have been receiving repeated inquiries from Italy and other continental European countries. Italy now is asking on this side for a cargo and New York bankers have been circulating inquiries for another country. It is learned that Italy has purchased one good-sized lot of Cuban manganese ore. Some new development of Cuban manganese deposits now is being carried forward and one operation in the Santiago district, is well advanced towards a shipping stage.

At present freight rates, it is difficult to export Cuban manganese ore to Europe in competition with Indian ore.

Not Interested

Cleveland, Feb. 16.—Representatives of Lake Superior iron ore agencies have been calling on operators of blast furnaces with a view to getting some expression of opinion as to buying ore for this year's requirements, but buyers, most of whom are well supplied with ore, are showing very little interest. Even in the east where imports have been almost entirely cut off furnace men are not disposed to make any promises at present as to buying lake ores.

(*For complete prices see page* 398.)

Sheet Mills Interested

In Advance in Panama Rates—Prices of Galvanized Product Are Still Advancing

Philadelphia, Feb. 15.—Eastern sheet makers are especially interested in the advance of $3 a ton to 45 cents per 100 pounds just announced by the steamship companies on iron and steel products for delivery to the Pacific coast by way of the Panama canal. Considerable business for Pacific coast buyers has been taken in recent months by eastern mills. Difficulty continues to be encountered in moving freight through the canal owing to the way freight room is sold up. No accommodations now can be obtained this side of April. There is not a great deal of life to the eastern sheet market. The mills are getting in just about enough day to day business to operate reasonably full. Some of the higher-priced contracts recently taken now are being specified against. The full market price at present appears to be 1.50c, Philadelphia, or 1.35c, Pittsburgh, for No. 10 gage blue annealed. Eastern galvanizers of sheets are advancing their prices because of the rise in spelter.

Galvanized Boosted $5 Ton

Pittsburgh, Feb. 16.—Unprecedented high price levels attained by spelter have been responsible for rather sensational advances for galvanized products. On Feb. 11, the American Sheet & Tin Plate Co. advanced galvanized steel sheets $5 a ton, and is now asking 3.25c for No. 28 gage. Other makers are quoting the same figure, and material has been booked at that price for immediate shipment. Black and blue annealed sheets, although not affected by the spelter situation, have hardened somewhat this week. No. 28 gage black sheets are selling at 1.85c and No. 10 blue annealed sheets have commanded 1.35c the last few days. Specifications are described as satisfactory, but mill operations remain below 60 per cent of capacity.

Galvanized Advanced

Cleveland, Feb. 16.—Sheet makers have advanced their quotations on galvanized to 3.25c, Pittsburgh, for No. 28 for immediate shipment. No contracts are being made. Quotations on black and blue annealed are unchanged and there is considerable irregularity.

Galvanized Advance Sharply

Chicago, Feb. 16.—Makers of galvanized sheets have advanced their product $5 per ton and now are asking 3.44c, Chicago mill, for No. 28 gage. This figure is based on the present price of spelter and inasmuch as this product has been advancing regularly for some time, it is fully expected a further advance in sheets will be made this week.

Even at this comparatively high price, contracts are being signed for galvanized sheets and consumers are taking tonnages as their immediate necessities require.

No. 28 gage black continues quotable at 1.94c to 1.99c, Chicago, the situation as to this form of sheet being entirely unaffected by the spelter market and the flurry in galvanized.

Sheets Stronger

Cincinnati, Feb. 15.—The sheet market is as good as could be expected considering the uncertainty of prices and the fact that dealers will not quote except for spot delivery. The spelter situation has made quotations on galvanized sheets fluctuate a great deal because it is not a question of price as to spelter, but whether or not it can be had when needed. Specifications on old contracts are good. Galvanized sheets for today are quoted at 3.25c for No. 28 gage, and black sheets No. 28 gage at 1.85c, both Pittsburgh basis.

Too Many Ship Orders

Some Yards Compelled to Decline to Make More Contracts—Steel for Some Vessels Placed

Philadelphia, Feb. 15.—Some of the Atlantic Coast ship yards now have reached the point on bookings where they are obliged to decline additional contracts. One large yard was forced to refuse orders for three boats last week and another found itself unable to consider the taking on of one or two additional. It is not known whether these matters in part at least were identical. In these cases the price seemed to be secondary to the promptness of delivery and good figures were offered. Various reports are to be heard as to the number of boats that still are in the market, but it is known that it is an impressive one. Steel for some of the recent boat contracts has been placed. The Carnegie Steel Co. has received about 9,000 tons, including 6,000 tons of plates from the Fore River Ship Building Corporation for the two tank boats for the Texas Co. The same company will furnish the shapes and Coatesville makers the plates, both totalling about 4,500 tons, for the boat last taken by the Newport News Ship Building & Dry Dock Co. reported a week ago. It now is officially confirmed that this vessel is for the Standard Oil Co., making a total of three boats for the latter taken by the Newport News yard and of six vessels in all booked recently by this builder from various transportation companies. Eastern plate mills still have been unable to note much expanse in their incoming tonnage. The volume is better than it was, but there is a noticeable lack of railroad buying. Plate prices remain quotable at 1.25c, Philadelphia, for February, 1.30c for March, and 1.35c for second quarter, equivalent to 1.10c, 1.15c to 1.20c, Pittsburgh, respectively, and appear to be maintained.

Plates for Ships

Pittsburgh, Feb. 16.—Plate manufacturers continue to report moderate improvement in the market. A number of attractive orders have been taken, and prices appear to be holding firmly. Material is being held at 1.10c for February, 1.15c for March and 1.20c for second quarter delivery. The Carnegie Steel Co. has taken 9,000 tons of plates and shapes for the Fore River Ship Building Co. for a couple of ocean vessels, and the Carnegie company will furnish the shapes for a Standard Oil Co. tank boat, to be built by the Newport News Shipbuilding & Dry Dock Co. The tanker will require 4,500 tons of structural material.

Quiet at Chicago

Chicago, Feb. 16.—Steel plates are in exactly the same position as bars and shapes except that the demand is somewhat less accented in this case. The present quotation of 1.29c, Chicago, for immediate delivery probably is not being shaded, but no new business is being taken for March on the advanced quotation of 1.34c, Chicago. Some recent increase in car buying has helped the plate market, but this is not sufficiently large to make an essential difference.

Improvement Noted

Buffalo, Feb. 16.—The mills and agencies of the Buffalo district report a noticeable improvement in the general

(*For complete prices see page* 398.)

market for bars, shapes and plates over the market of a week ago. The orders coming in are for miscellaneous materials, representing a much wider range than previously noted. While the booking is largely for small lots, both the number and the aggregate volume of the business are increasing.

March delivery prices are being asked on business for shipment over the remainder of February or at 1.15c, base, and early in March it is believed the second quarter quotation of 1.20c is to be insisted upon, for deliveries over the remainder of that month.

While the second quarter price of 1.20c has not been advanced as yet, all orders at this figure for delivery over the latter part of the quarter are being taken subject to approval by the mills, indicating that a 1.25c price is in sight. The general impression prevails among the mills and agencies here that business is improving slowly.

Scrap Not So Strong

Weakens in the Pittsburgh District—Larger Transactions at Philadelphia

Pittsburgh, Feb. 16.—Old materials are not so strong this week. Heavy melting steel, which commanded as high as $12.25, now is hovering around $11.75, and other grades are correspondingly weak. Melters are not in need of additional material, and probably will not figure in the market until tonnages under contract have been taken.

Broader Market

Philadelphia, Feb. 16.—More breadth was shown by the iron and steel scrap market in eastern Pennsylvania the past week and larger transactions in several grades were closed. A Harrisburg buyer took about 2,000 tons of wrought pipe at $10.25, delivered, and still offers that figure. Small sales of pipe at $10.50, delivered, also were made. A Bristol, Pa., cast iron pipe maker was the buyer of a number of lots of heavy cast for several dealers, taking about 2,000 tons for early shipment at $12, delivered. A Harrisburg consumer bought 2,000 to 3,000 tons of yard steel at $9.50, delivered, and a Schuylkill Valley works has been closing for odd lots of 1,000 tons and less of No. 1 heavy melting steel at $10, delivered. It is doubtful, however, whether a round block of No. 1 steel could be obtained at less than $10.50 delivered. Low phosphorus, for which there are some offers, is scarce, owing to light mill operations, and $14, delivered eastern Pennsylvania, is obtainable. Owing to the extraordinary freight rates, there have been no developments in the offers for iron and steel scrap for Italy, England and for other foreign countries.

Prices Firm at Buffalo

Buffalo, Feb. 16.—Led by activity in heavy melting steel and some movement of turnings and borings the entire price schedule for the various lines of scrap has undergone a stiffening influence within the past week, but not to a sufficient extent to make any noticeable change in the range quoted a week ago, with the exception of heavy melting steel. This line has been advanced to $10.50 to $10.75.

An increase in demand has paralleled the firming of prices. One of the leading consumers of heavy melting steel has covered requirements for a reasonable period. Most of this buying was done on a basis of $10.50. The taking on of material by this interest launched a speculative movement in heavy melting steel among local scrap dealers resulting in some of the yards making purchases at slightly above the current minimum quotations. The dealers are looking for the demand to increase to an extent where they will be able to dispose of this material at a sufficient advance to prevent their taking a loss.

Immense Stocks

Cleveland, Feb. 17.—The scrap market is fairly active from the traders' standpoint, but mill buying is extremely light. Brokers' covering of shortages has been in sufficient volume to maintain prices, especially as producers and holders of material are confident that a decided increase in demand is not far ahead. While stocks are rather closely held, supplies of scrap in this district have accumulated for so long that they have reached mammoth proportions and any notable price increase probably would serve to loosen up a flood of material. Mill buyers are cautious, not caring to lay in supplies of material on an advancing market when the prices of their own products still hover around their present low levels.

Scrap Market Stationary

Chicago, Feb. 16.—No important movement has taken place in the scrap iron and steel market in Chicago and conditions seem to be settled for the present. Prices are approximately the same as for a fortnight past, slight changes, mostly in the way of advances, being registered from time to time. Rolling mill grades are quiet, as mills bought rather heavily late in January and probably will not be under necessity of entering the market again for 60 days. Railroads are not offering heavily and only two lists are before the market at present, the Michigan Central and the Union Pacific each offering approximately 2,000 tons.

Soft at St. Louis

St. Louis, Feb. 15.—The scrap market remains soft, although the railroads are still receiving maximum prices for their scrap from dealers, and consumers have not yet come into the market, but are expected to do so at an early date. These lists are out this week: Union Pacific, 2,000 tons of No. 1 and No. 2 railroad wrought; C., C., C. & St. Louis, 5,700 tons, of which 3,000 tons is long steel rails and 750 tons No. 1 railroad wrought; Frisco, 810 tons; International & Great Northern, 745 tons.

Steel Scrap in Demand

Cincinnati, Feb. 15.—Demand for steel scrap continues better than for cast iron scrap. Heavy melting steel is quoted from $9.00 to $9.50 per gross ton and No. 1 busheling at from $5.75 to $6.25 per net ton, these being the best sellers of the past week. Railroads have large lists to throw upon the market as soon as an improvement is realized and there is also a large surplus in dealers' yards and throughout the rural districts. The feeling in the market is much better, but it will take a long period of activity to bring about an advance in prices. All quotations today are quoted as unchanged from those that have prevailed here since the first of the year.

(*For complete prices see page* 398.)

Tin Plate Buying Light

Pittsburgh, Feb. 16.—Tin plate mills in western Pennsylvania and eastern Ohio are being driven at almost maximum capacity. The American Sheet & Tin Plate Co., is operating tin plate mills at approximately 93 per cent of capacity. Specifications against contracts are heavy, but new buying is light. Several mills are refusing to shade 3.20c for base size boxes.

John L. Davis, master mechanic in the blooming mills of the Jones & Laughlin Steel Co., Pittsburgh, died at his home in that city, Feb. 14. He was 50 years old.

More Structural Inquiry

But Tonnages Awarded Not Large—January Makes Very Poor Showing in Lettings

New York, Feb. 16.—Structural lettings in the country during January aggregated 25 per cent of total capacity, or approximately 43,000 tons, according to the monthly statistics of the Bridge Builders and Structural Society, reported at a meeting held in Chicago, Feb. 11. In December, the lettings were 35 per cent of capacity, or 60,000 tons; in November, 20 per cent, or 35,000 tons; in October, 35 per cent, or 60,000 tons; in September, 38½ per cent, or 65,000 tons, and in August, 27½ per cent, or 50,000 tons. The present indications are that the February showing will be considerably better than other recent months, as the volume of miscellaneous lettings has been running heavier. In the metropolitan district, the increased number of structural inquiries that has appeared during the past week has brought some encouragement. While many of these lots individually are small, the broader inquiry is regarded as a hopeful sign. One large fabricator received 17 new inquiries in the week. Another lot of 7,500 tons for Brooklyn elevated railroad construction is in the market. A good feature of the situation is the large number of important projects which are being shaped in the hands of architects in this city, and of dormant undertakings that now are being revived. Lettings of the week in the metropolitan district and vicinity totaled about 5,000 tons, a better showing. The general price on shapes remains 1.26c, New York, or 1.10c, Pittsburgh, but one eastern producer is understood to have been taking prompt orders below that figure.

Tonnage is a Little Better.

Philadelphia, Feb. 15.—Small structural requirements either prospective or immediate seem to be more numerous in parts of this district, particularly in southeastern centers. The bookings in Philadelphia territory also are slightly larger, totalling about 2,000 tons in the week, one contract of which calls for 1,250 tons. The individual amounts required in both inquiries and awards, however, are so small that the aggregate tonnage remains keenly disappointing and as the shops and mills nearby this district are in a poor position, they usually are willing to compete sharply for desirable orders. As a consequence, low prices on fabricated steel are current, some of which are based on former low-priced contracts for plain material. The continued narrowness of the market and the close competition raise the question whether the advance to 1.30c, Philadelphia, or 1.15c, Pittsburgh, for March delivery on shapes can be maintained. Following its withdrawal of its budget inquiry for 1915 bridge needs, the Pennsylvania railroad is putting out specific jobs, having placed one small order and asking for bids on another in the week.

No Large Contracts

Pittsburgh, Feb. 16.—No large contracts involving structural material have been placed with fabricators in this district this week. Several projects are being considered quietly and it is probable awards will be made shortly. Work has been resumed on the Munsey building at Washington, D. C., requiring 1,500 tons, which will be furnished by the Jones & Laughlin Steel Co.

Keen Competition Expected

Cleveland, Feb. 16.—The only large tonnage of structural material pending in the Cleveland district is the Clark avenue viaduct, 9,400 tons, on which bids will be received March 2. It is expected that the bidding on this tonnage will bring out keen competition. Prices seem to be somewhat firmer.

Inquiries Greater.

Buffalo, Feb. 16.—Fabricators of the Buffalo district report that the number of inquiries for structural material is noticeably greater than it was during the same period a year ago. The work being figured upon, however, is somewhat smaller in aggregate tonnage. This is due to the absence of large jobs being advanced. The inquiries seem to be confined to consumers scattered over a large part of the territory wanting but small tonnages for their undertakings.

Contracting is Light

Chicago, Feb. 16.—Structural shapes are in somewhat better demand as the building season nears, but at present there is a dearth of large projects involving heavy tonnages. During the past week, the only matter of importance in the west is the letting of a bridge over the Red river, Louisiana, by the Vicksburg, Louisiana & Pacific Railway Co., involving 1,500 tons. Shapes are available for immediate delivery at 1.29c, Chicago, and at an advance of $1 for March delivery with practically no tonnage being taken at the latter figure up to this time.

(*For complete prices see page* 398.)

CONTRACTS AWARDED.

Richmond county court house, Staten Island, N. Y., 400 tons, awarded W. B. Shafer & Co.

Apartment for I. Randolph Jacobs, Seventy-ninth street and Fifth avenue, New York City, 375 tons, awarded Belmont Iron Works.

Nine stations for the Sea Beach elevated line in Brooklyn, 300 tons, general contract awarded Post & McCord and fabrication will be furnished by the American Bridge Co.

City market, Newark, N. J., 1,600 tons, general contract awarded Essex Construction Co. and steel work placed with Hay Foundry & Iron Works.

Bridge for Pennsylvania railroad near Elizabeth, N. J., 470 tons, awarded Pennsylvania Steel Co.

Office building for Victor Talking Machine, Camden, N. J., 1,250 tons, awarded Eastern Steel Co.

Addition to Strand Hotel, Atlantic City, 300 tons, awarded Eastern Steel Co

Public School No. 54, Bronx, New York City, 650 tons, general contract awarded to Altoria Realty & Construction Co.

Public School No. 48, Bronx, New York City, 600 tons, general contract awarded Lawrence J. Rice.

Stock house for Acme Cement Co., Catskill, N. Y., 300 tons, awarded McClintic-Marshall Co.

McKinley School, Newark, N. J., 200 tons, awarded Chas. Arny, of Elizabeth.

Pier C at Brooklyn navy yard, 250 tons, awarded L. F. Shoemaker & Co.

Vicksburg, Louisiana & Pacific Ry. Co., bridge over the Red River, La., 1,502 tons, to Modern Steel Structural Co.

CONTRACTS PENDING.

Bridge work for Pennsylvania lines west, 5,000 tons, bids entered.

Bridge for Chesapeake & Ohio railroad, Thermond, W. Va., 500 tons, bids being taken.

Freight sheds, Savannah, Ga., 3,200 tons, bids being taken.

High School, Worcester, Mass., 500 tons, bids being taken.

Bridge for Pennsylvania railroad, Dunlap, Pa., 300 tons, bids being taken.

Barge canal bridges at Utica, N. Y., for New York Central, 650 tons, bids being taken.

Barrel plant for Standard Oil Co., at Long Island City, New York, 500 tons, bids being taken.

Three buildings for New York State Hospital at Ward's Island, N. Y., indefinite tonnage of fabricated steel and reinforcing bars required.

Motordrome at Brighton Beach, N. Y., tentative plans again being considered; estimated to require 4,000 tons or more.

Third tracking of Broadway elevated line in Brooklyn for New York Municipal Railways Corporation, 7,500 tons, bids being taken Feb. 25.

Bridge work for Atlantic coast line, including rolling lift bridge in Florida, 200 tons, bids being taken.

Filter plant, Philadelphia, 200 tons, bids being taken.

Apartment for Cross & Cross, New York City, 1,000 tons, project revised and bids again being taken.

Ferro Stocks Reduced

And Consumers Are Getting Anxious as Uncertainty Concerning Imports Increases

New York, Feb. 16.—With uncertainty still surrounding the probable early lifting of the embargo by the English government, the ferro-manganese situation in this country is taking on a somewhat more serious aspect, especially with steel works operations now increasing. In the absence of any definite advices as to sailings from English makers and the further appearance of new proposals and suggestions from British sources, there now is small hope that any tonnage will be imported in February. It is impossible for the representatives of the English sellers to give their customers any satisfaction as to the prospects for early delivery, since the former's expectations have been disappointed so many times recently. A new angle to the situation is the advice that the English government is considering the adoption of a rule that the consumers shall be allowed only one-half the amount specified in unfilled contracts, when licenses are issued.

Consumers are getting more anxious about their supplies as the time goes on and the problem remains unsolved, while they see their stocks being reduced. It is practically impossible to obtain any lump material for prompt shipment, since the few lots that are held by sellers are not being offered. One buyer has offered to pay $90, seaboard, for spot, without success. Sales of ground ferro-manganese are commanding 5½ cents per pound at the grinding plant or $123.20 per gross ton, and the producers are unable to meet the demand. There continues to be more or less buying at the official price of $68, for ferro-manganese, to come in when the sellers are able to ship. A Chicago steel foundry interest and a Youngstown steel maker who were asking for 500 to 1,000 tons each have closed, but neither took the full amount of the inquiry. The Maryland Steel Co. now has one of its Sparrows Point furnaces making ferro-manganese for the use of itself and affiliated companies.

As a counter development to the continued uncertainty over ferro-manganese, there is more activity in the spiegeleisen market. Some large sales of domestic brands to home buyers are rumored. Sizable tonnages for export also have been in the market in this country. The Dunbar, Pa., maker has made further sales and has advanced its price from $25 to $26 at the furnace.

A sale of 200 tons of spot ferro-manganese was made to an Ohio steel maker the past week at $100, Pittsburgh.

Billet Contracts

Are Being Renewed—Prices Are Showing Firmness

Pittsburgh, Feb. 16.—Specifications against contracts for sheet bars continue to come out at a rather satisfactory rate. Tin plate mills are taking maximum requirements, and manufacturers of steel sheets are specifying for about 60 per cent of their maximum needs. The Carnegie Steel Co., as previously reported, is out of the market for sheet bars. Billets are not so active as sheet bars. There has been no new demand recently, and no trace of sales can be found. Prevailing quotations at Youngstown and at Pittsburgh appear to represent the market.

Renewing Billet Contracts

Philadelphia, Feb. 15.—Several good-sized transactions in billets now are being put through by eastern makers. In some cases, they represent renewing of annual contracts which expire March 1 or sooner. Some makers have undertaken a firm stand against renewing these contracts at a less figure than called for in the expiring commitments and are doing their best to obtain advances. They have been able to secure the former figures, at least in the business taken. Included in the bookings was one good-sized tonnage for an eastern user. A Cumberland, Md., buyer is inquiring for 1,000 tons of sheet bars. Ordinary rolling billets continue to be quoted at $21.40, Philadelphia, or $19, Pittsburgh, and forging billets at $24.40 to $25.40, Philadelphia. Export business in billets to Europe is blocked by freight quotations of around $12 per ton.

Making Daily Shipments.—Notwithstanding the fact that the main plant and the carpenter shop of the Columbia Fire Brick Co., Strasburg, O., was destroyed by fire recently, the company advises it is making daily shipments of brick from stock and is filling all old and new orders. The company is making immediate preparations for rebuilding the plant and expects to have it in full operation by March 15.

Coke Quiet

Production in Connellsville Region is Increasing

Pittsburgh, Feb. 16.—The Connellsville coke market is quiet. Spot blast furnace fuel continues to be offered at $1.55, ovens, but sales do not involve heavy tonnages. Contract coke is quoted at a spread from $1.65 to $1.75, ovens. Foundry coke is unchanged. The Connellsville *Courier* for the week ending Feb. 6 says production was 256,358 tons, an increase of 13,750 tons compared with the week before.

Demand at Minimum

Cincinnati, Feb. 15.—Demand for both furnace and foundry coke from southern fields continues at a minimum. Sales are confined mostly to carload lots of foundry coke and are widely scattered, an example being that one large dealer here sold only ten carloads of coke during the past week. Foundries are not due to buy until well toward July and furnaces are well supplied with fuel for the first half. No changes in prices are reported from either the Wise County, Pocahontas or New River districts, as operators in these fields are keeping only enough ovens in blast to supply contracts.

Pipe Prices Boosted

Pittsburgh, Feb. 16.—Under date of Feb. 11, the National Tube Co. sent out new cards showing an advance of $2 a ton for black pipe, 1 to 6 inches, and smaller sizes of galvanized pipe were advanced from $2 to $6 a ton. Line pipe, from 2½ to 6-inch, was advanced $2 a ton, and 2-inch oil and gas line pipe was also advanced. Iron pipe makers, on Feb. 12 increased prices for galvanized wrought iron pipe, from 1 to 6 inches, $4 a ton. Boiler tubes were not affected.

Battleship Bids

Washington, Feb. 17. (By wire.)—Bids on plates, shapes and bars for the battleship California were opened at the navy department today, calling for a total of 15,530 tons. The Worth Bros. Co. is lowest on plates amounting to 9,430 tons. The Carnegie Steel Co. is lowest on shapes and bars, there being 2,720 tons of the former and 125 tons of the latter, and the Carbon Steel Co. is lowest on special treatment plates amounting to 3,250 tons.

(*For complete prices see page* 398.)

Exports of Machinery

Show Heavy Decrease in Spite of Increase in Exports of Machine Tools—Some Interesting Facts

The government report on iron and steel imports and exports for December and for the 12 months ending with December shows that for the year, of which five months were after the declaration of war by most of the European countries, the exports amounted to 1,549.480 tons, compared with 2,745,611 tons in 1913. For December, the exports were 117,762 tons

IRON ORE IMPORTS, DECEMBER.

	Tons. 1914.	Tons. 1913.
Spain	.....	11,504
Sweden	.....	39,024
Canada	.....	4,301
Newfoundland and Labrador.	.....	17,820
Cuba	51,053	137,035
Other countries	.....	14,208
Total	51,053	223,892

in 1914, compared with 181,716 tons in 1913. Comparing the two Decembers, losses are shown by all products except semi-finished steel, steel bars, tin and terne plate, wire products and horseshoes. Imports have declined much more than exports since war was declared. In December, 1914, the imports amounted to only 9,494 tons, compared with 26,453 tons in December, 1913, and 24,165 in November, 1914. Comparing the two Decembers, the only gain in tonnage was made by scrap. Iron ore imports in December were suspended entirely except from Cuba, from which island 51,053 tons were received. In December, 1913, the imports amounted to 223,892 tons.

Turning to machinery, some interesting facts are revealed. The value of the exported machinery in Decem-

IRON AND STEEL IMPORTS, GROSS TONS.

	December, 1914.	December, 1913.	Twelve months ending December, 1914.	Twelve months ending December, 1913.
Scrap	2,096	1,313	34,849	44,154
Pig iron	3,678	12,449	138,903	156,450
Ingots, blooms, billets of steel, n. e. s.	1,842	2,809	40,188	26,675
Wire rods	79	940	6,954	16,097
Rails	251	1,642	22,571	10,408
Bar iron	1,153	1,328	16,414	28,243
Structural	94	1,041	10,144	11,659
Sheets & plates	69	191	2,893	4,310
Tin & terne plate	232	4,740	15,411	20,680
Total	9,494	26,453	288,327	318,676

ber, 1913, was $10,300,945, while in December, 1914, the value was only $6,372,041. Losses were sustained by nearly all kinds of machinery except metal-working machinery, including machine tools, of which the value of the exports for December was $2,432,331, compared with $1,349,570 in December, 1913. The value of the machinery exports for 1914 was $91,818,664, compared with $127,980,880 in 1913 and $120,403,692 in 1912.

Of automobiles, 2,576 were exported last December, compared with 2,389 in December, 1913. Of the automobiles exported in 1914, 1,279 were classed as commercial, compared with only 88 in 1913. The values were $4,386,427 in 1914 and $2,153,144 in December, 1913. Last December, six aeroplanes were exported, valued at $63,500, while parts of aeroplanes exported were valued at $90,004. In

IRON AND STEEL EXPORTS, GROSS TONS.

	December, 1914.	December, 1913.	Twelve months ending December, 1914.	Twelve months ending December, 1913.
Scrap	1,511	7,689	33,134	97,429
Pig iron	6,746	25,440	114,423	277,648
Billets, ingots and blooms of steel	3,430	2,232	50,496	91,847
Wire rods	7,435	7,451	61,853	61,636
Steel rails	3,567	22,518	174,680	460,553
Steel bars	22,002	14,911	123,002	211,715
Iron bars	384	653	5,226	16,616
Struc. iron and steel	10,758	24,754	182,395	403,264
Hoop, band and scroll	706	1,442	9,953	16,840
Sh'ts & plates	17,332	26,938	280,090	463,414
Tin & terne plates	3,977	2,391	59,548	57,811
Barbed wire	8,306	7,863	93,818	82,050
All oth. wire	12,474	8,856	87,021	108,232
Cut nails	138	387	3,423	3,790
Wire nails	3,830	3,063	36,079	43,637
All oth. nails includ. tacks.	306	359	3,183	3,969
Pipes and fittings	11,669	21,698	199,618	301,784
R. R. spikes.	168	580	6,937	11,328
Bolts, nuts, riv. wash'rs	1,055	1,886	15,127	22,737
Horseshoes	1,696	114	5,903	1,247
Cast radiators	272	491	3,571	8,064
Total	117,762	181,716	1,549,480	2,745,611

December, 1913, one aeroplane, valued at $6,375, was exported.

Exports of copper in December, 1914, were valued at $6,960,464, compared with $12,431,773 in December, 1913.

METAL MARKETS

New York

Feb. 16.

Prices on spelter continue largely nominal, but manifestly are higher and the market continues very strong. At present, the price on prime western for prompt, February and March shipment is somewhere between 8.75c and 9c, St. Louis, and probably nearer the outside figure, especially for prompt and February. April and May can be had at 8.75c, St. Louis, and probably at 8.65c. Producers report inquiry from domestic consumers, which had fallen off for a week or 10 days, again is active, especially on the part of the big galvanizing interests. These concerns are anxious to close for their future requirements. There also is a demand for futures from brass mills, as well as a good inquiry from abroad. Altogether, although ore and smelter production lately has been increased considerably, it appears as though producers will have no difficulty in getting rid of every pound of spelter they produce and hence no important drop in prices is expected for a long time to come.

Prices on copper last week showed some weakness, but the low figures have disappeared and electrolytic again is quotable at 14.62½c to 14.75c, delivered 30 days. There is a better domestic demand and good inquiries from abroad, but producers still report it is hard to make shipments due to the congestion in ocean traffic. Producers continue well sold ahead, so that these interests are exerting no pressure to sell. The best brands of lake have sold at 15.25c, cash. Good ordinary brands, however, now can be obtained at 14.62½c to 14.75c, cash. Casting copper is held at 14.50c, delivered 30 days, while for special brands 14.62½c, usual terms, is asked.

The tin trade here has been expecting a good-sized drop in prices on the London metal exchange; instead, however, prices there have remained fairly firm. As a result of this expectation there has not been much business in tin here. Today there is a good inquiry from consumers but sellers are scarce, which is due to the fact that prices here are about 2.75c per pound under the cost of importing at present London prices. Spot and February are held at 36.25c, March at 35.50c; April at 34.50c and beyond at 34c.

Freight Rates

To Pacific Coast Via Panama Canal Advanced

Another advance of $3 a ton or to 45 cents per 100 pounds, in the freight rate on iron and steel products, for delivery to the Pacific coast by way of the Panama canal, has been put into effect by the various steamship companies. Several weeks ago, the rate was advanced from 25 to 30 cents per 100 pounds. When the canal route was opened, the rate originally fixed on iron and steel products was 30 cents per 100 pounds. Subsequently, this was reduced to 25 cents and then restored to 30 cents. The present advance makes the rate the highest it has been at any time and has been brought about by the recent active demand for freight room for Pacific coast destinations. Iron and steel makers entering the market the past several weeks have found it impossible to obtain any room this side of April. One large shipment of pipe which had been brought to the Atlantic coast for steamship transportation to Pacific coast, it is reported, was forced to be reshipped by all-rail, because of the water freight conditions. As stated previously, the season's movement of tin plate to the Pacific coast packers, now under way, is being routed almost entirely by the canal. This represents a large tonnage.

Eli A. Race, for many years connected with the Willcox & Gibbs Sewing Machine Co., and at one time vice president of the Draper Mfg. Co., Hopedale, Mass., manufacturer of textile machinery, died Feb. 12, at his home in Brooklyn, aged 68 years.

Bolt Market

Is Steadier at Chicago—Railroad Buying Helped

Chicago, Feb. 16.—Recent buying by railroads has assisted the bolt and nut market to gain a steadier tone and quotations now are on a better basis than has prevailed. A combination of low priced bar iron early this year and great need on the part of at least one maker of bolts and nuts caused some little flurry recently, but this apparently has passed and quotations are now steady on the basis of discounts now being quoted. A better feeling pervades the trade and continuance of railroad buying is giving better volume to sales.

Want Quick Shipment

Cleveland, Feb. 16.—The demand for nuts and bolts shows some improvement. Some users of rivets are urging prompt shipment, but the general demand for rivets is only fair.

Nuts, Bolts and Rivets

Pittsburgh, Feb. 16.—Nut, bolt and rivet makers describe prevailing quotations as firm, and some makers say a moderate improvement in business is noted. Specifications for rivets have increased in volume considerably.

Cast Pipe

Not So Active in the East—Prices Tend Upward

New York, Feb. 16.—New business in cast iron pipe in eastern districts has run lighter the past week as compared with other similar recent periods. Makers, however, have been accumulating a favorable amount of tonnage, especially in the smaller sizes, since the first of the year, and find some encouragement in the volume of business if not in the prices ruling. The market continues to show only modest advances in the quotations being made, though most makers seem more determined to ask higher prices. The United States Cast Iron Pipe & Foundry Co. has taken 657 tons of 4 to 16's for Worcester, Mass., at $21.30, delivered. The Standard Cast Iron Pipe & Foundry Co. finally took the 3,300 tons of 36's for the Bridgeport Hydraulic Co., Bridgeport, Conn., and also 192 tons of 4 to 8's for New Rochelle, N. Y. John Fox & Co. will receive 300 tons of 8's for Yonkers, N. Y., upon which they bid $21.13, delivered.

Cities Still Buying.

Chicago, Feb. 16.—Attention of sellers of cast iron pipe still is being centered on requirements of municipalities for their needs during the present year and some fair tonnages are being disposed of. The United States Cast Iron Pipe & Foundry Co. has been awarded 1,100 tons at Milwaukee and this week bids will be opened on 4,250 tons at Portland, Ore., 300 to 500 tons at Battle Creek, and 550 tons at Rockford, Ill. Laramie, Wyo., will open bids, Feb. 23, on 1,200 tons, and Fairbault, Minn., will take bids on 125 tons the same day. A contract for 250 tons at Redford, Mich., has been awarded to the American Cast Iron Pipe Co.

Personals

The Erie Pump & Equipment Co., Erie, Pa., successor to the Northern Equipment Co. and the Erie Pump & Engine Works, has just taken into its employ as sales engineer, N. H. Brown. Until recently, Mr. Brown has been Chicago representative of the Bury Compressor Co.

A. S. Baldwin has resigned as manager of the Best Mfg. Co., Pittsburgh, effective not later than April 1. The Best Mfg. Co. was recently taken over by the Kennedy-Stroh Corporation. Mr. Baldwin formerly held the position of superintendent with the American & British Mfg. Co., and the Driggs-Seabury Ordnance Co., and was also general manager of the Alberger Pump & Condenser Co., Newburgh, N. Y., for three years. His present address is Oakmont, Pa.

E. M. Breed, San Francisco, who for the past eight years has been district manager of the Canadian Allis-Chalmers, Ltd., with headquarters at Vancouver, has been appointed district manager of the Pelton Water Wheel Co. He will continue his headquarters at Vancouver. Mr. Breed is a graduate of the University of Maine, college of technology, and is a member of the American Institute of Electrical Engineers. Previous to becoming manager for the Canadian Allis-Chalmers Co. he was with the sales force of the Canadian Westinghouse Co., at Montreal.

Hickman, Williams & Co. announce the following changes in their organization: Day Williams, resident manager at Birmingham, has been transferred to Cincinnati as resident manager of the Cincinnati office. G. M. Day, formerly with the St. Louis office, has been transferred to Birmingham as resident manager of that office. Richmond Nicholas has been appointed resident manager of the Chicago office. T. A. Arthur has been appointed resident manager of the Pittsburgh office. The Chicago office has recently moved from the old headquarters in the Rookery building to new quarters, 1701 McCormick building.

Rejected

Proposed Reduction of Wages in Sheet and Tin Plate Mills

Pittsburgh, Feb. 17. (By wire.)—Members of the Amalgamated Association working in sheet and tin plate mills have refused to accept wage reductions proposed at the conference here Feb. 6. The reductions based on sliding scales amounted to about 6 per cent for tin plate mill employes and 11.2 per cent for sheet mill men.

Officers of the association submitted the proposition to members of the organization and finished compiling a referendum vote last night. While the majority of the members voted against the proposed wage cut, it is known that at some mills the men expressed themselves as willing to accept the reduction. Officers of the association would not give out the vote by individual mills.

Rather serious complications will follow the repudiation of the new scale. Several manufacturers attending the conference here plainly indicated that they would either close their plants or operate under open-shop policies if the reductions were not accepted. There are a dozen sheet and tin plate companies operating under the Amalgamated scale which was accepted July 1 to last for the period of a year.

Millions

Involved in Inquiries and Orders for Shells

Pittsburgh, Feb. 17. (By wire.)—The Pittsburgh Foreign Trade Commission has received an inquiry for 1,000,000 3-inch drop shells for the British government, involving an expenditure of $4,000,000. The Electro Steel Co., Inc., Charles R. Bryson, president, refused to quote on the inquiry for humanitarian reasons.

It is understood that an order for $5,000,000 worth of drop shells was placed with a Pittsburgh maker a few days ago for shipment to England. Shells made from drop forgings weigh about 40 pounds each.

Results With High Blast Heats

Practice of the Illinois Steel Co. in Smelting Mesabi Ores With High Blast Temperatures —Necessity for Improved Stove Design and Operating Efficiency

BY WALTHER MATHESIUS

THE USE of high blast heats on furnaces melting Mesabi ores is still the exception, the average blast temperatures carried on Mesabi stacks seldom reaching 1,100 degrees Fahr. Some 15 years ago, when the use of fine Mesabi ores in larger proportions to the total burden first came into practice, it was found difficult to employ even those blast heats which it had been possible to carry with the old range ores. The furnaces refused to "take" high heats, and would persistently labor with irregular stock movement, which impaired the practice and increased the coke consumption. By lowering the blast temperature, the working of the furnace became smoother, and experience taught that with the softer and more easily reduced Mesabi ores, satisfactory practice could be obtained with comparatively low blast heats. Therefore a large number of Mesabi furnaces have ever since been operated on very low blast temperatures, ranging between 800 and 1,000 degrees. In the face of these difficulties, furnace men were slow to recognize that furnaces could be so designed as to permit a free movement of the charges in combination with the use of higher heats. Since higher blast temperatures did not seem to offer great advantages in the smelting of Mesabi ores, investments in hot-blast stoves were not as attractive to the furnace men as labor-saving devices and means of obtaining greater tonnages.

The effect of this preference is keenly felt at the present time. It has brought about the peculiar situation, that the majority of our furnace plants (among them some of the most progressive) lack modern and efficient stove equipment. The result is that, even where the proper furnace lines have been adopted and conditions are now favorable to the successful employment of higher blast temperatures, the heats required for the greatest fuel economy are not available.

In an endeavor to obtain results, even with inadequate equipment, we find that, at many plants, the stoves are worked far beyond their capacity. This leads, in many instances, to a situation in which the coke saving in the furnace is offset by the losses of heat carried away in the waste gases escaping from the overburdened stoves. Quite frequently, 40 per cent and more of the total gas production is used in heating the blast, thereby seriously curtailing the amount of gas available for conversion into power. The more efficiently this power is generated, and the greater the demand for it, the higher becomes the value of the furnace gases, and the more necessary it is to economize the gas used in the stoves.

There are furnace plants which have raised their blast temperature to an average of 1,000 to 1,100 degrees Fahr., and are obtaining very low fuel consumption with Mesabi ores, by means of good furnace lines, suitable coke, correct distribution, and other essentials. From considerations of the high value of the surplus gas on the one hand, and lowered stove efficiency under forced operation, on the other, it may have appeared uneconomical to attempt higher blast heats, quite apart from the theory according to which the fuel saving to be expected by raising the blast temperature above a fixed range varies inversely with the reducibility of the ore burden, and rapidly decreases with increased temperatures. Accordingly, occasional attempts to carry still higher heats were, as a rule, abandoned.

But actual practice in recent years has proved a different conclusion, having shown that a considerable coke saving is still obtainable when the heats are raised above the 1,100 degree line. I make this assertion, notwithstanding the fact that some experiences, under conditions unfavorable to the use of high heats—conditions such as are inherent in raw materials, furnace lines, and methods of operation—may have tended to indicate the contrary.

In confirmation of this point I may mention that, during the last year, the blast temperatures at two of the bessemer furnaces at the South Chicago plant of the Illinois Steel Co. were raised above the 1,100 degree line, and for many months temperatures from 1,100 to 1,300 degrees Fahr. were employed, with the result that the coke consumption was reduced to extraordinarily low figures without causing any operating difficulties. Data from the practice of these furnaces are shown in Table I.

Since it has been shown, therefore, that with proper furnace conditions it is not only possible, but profitable in coke economy, to carry high heats on Mesabi furnaces, the next problem is to generate these heats in the most efficient way, and without losing through inefficient stove operation the advantage thus to be gained. In other words, the problem of adapting furnace lines, raw materials and operation to the new practice having been proved capable of solution, efficient heat generation, through suitable stove construction and operation is of paramount interest today.

Stove Construction

It is not my intention to comment here on the various types of hot-blast stoves, or to discuss the advantages of any special design. I shall give only a general outline of the conditions essential for economically successful stove practice.

When at an existing furnace plant the use of higher blast temperatures is contemplated, the simplest means is often deemed to be an enlargement of the stove capacity by building an additional stove. This will, of course, increase the available heating surface and produce a higher blast temperature, but not without considerably decreasing the efficiency of the hot-blast equipment. Besides complicating operation, by increasing the number of valves and pipes, it adds to the radiating surface of the stoves, and thereby to the radiation losses; for instance, where a fifth stove has been erected, these will increase at least in direct proportion, in other words, 25 per cent.

In spite of these disadvantages, many blast furnace managers have decided that the erection of a fifth stove is the best means of increasing their stove capacity, for two obvious reasons: (1) because it can often be done with practically no other changes to existing equipment; and (2) because it insures a greater regularity of blast temperature.

While it appears that having a fifth stove available is beneficial to the furnace practice, in allowing the regular maintenance of higher heats, yet

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A paper read at the February meeting of the American Institute of Mining Engineers. The author is connected with the Illinois Steel Co., South Chicago, Ill.

Table I.

DATA CONCERNING THE PERFORMANCE OF NO. 4 AND "E" BLAST FURNACES AT SOUTH WORKS, ILLINOIS STEEL CO.

Date.	Average daily product.	Pounds per ton: Ore, scale, etc.	Coke.	Stone.	Scrap used over product.	Flue dust produced.	Per cent Mesaba.	Cu. ft. of wind per min. at engines.	Average blast. Temp.	Average blast. Press.	Iron analysis. Si.	Iron analysis. S.	Actual yield.
1914	Blast Furnace No. 4.												
*February	290	4,572	2,464	1,029	—54	480	62.6	29,600	1,085	11.1	1.56	0.031	50.05
March	518	4,062	1,744	781	17	193	67.4	41,140	1,170	15.7	1.29	0.025	54.76
April	543	4,003	1,702	752	73	227	66.5	42,950	1,196	16.6	1.23	0.027	54.40
May	530	4,076	1,733	785	12	152	61.4	46,260	1,161	15.4	1.24	0.028	54.68
June	572	4,099	1,699	804	13	82	94.2	48,970	1,243	15.6	1.35	0.032	54.36
July	560	4,196	1,765	858	—13	109	95.8	47,670	1,164	15.4	1.33	0.032	53.65
August	549	4,190	1,828	884	—23	81	96.4	44,950	1,129	15.1	1.37	0.033	53.91
1913	Blast Furnace E.												
September	525	4,012	1,691	677	118	169	92.9	47,750	1,225	15.1	1.30	0.034	53.24
October	514	4,047	1,711	774	113	171	93.0	46,390	1,251	16.2	1.48	0.043	52.85
November	467	3,850	1,783	827	131	238	82.7	46,790	1,157	16.4	1.51	0.039	55.22
†December	536	3,852	1,705	780	109	201	83.7	45,510	1,250	15.7	1.33	0.041	55.69
1914													
†January	463	4,067	1,821	819	55	299	82.9	43,350	1,230	15.4	1.29	0.038	53.82
February	489	4,216	1,850	827	11	245	74.4	42,940	1,200	16.6	1.42	0.049	52.82
March	559	4,144	1,815	790	18	197	66.3	44,120	1,113	17.9	1.31	0.037	53.63
April	582	4,035	1,742	775	23	234	65.9	43,950	1,146	17.7	1.27	0.028	54.92
May	538	4,205	1,890	868	18	161	51.5	45,740	1,059	16.4	1.43	0.029	52.87
June	558	3,993	1,894	856	22	81	78.7	46,190	1,009	15.4	1.40	0.030	55.61
July	548	4,073	1,876	875	—22	108	95.5	46,040	1,128	15.7	1.35	0.036	55.47
August	520	4,061	1,981	893	—21	79	96.2	45,680	1,098	14.8	1.45	0.036	55.60

*Blown in, Feb. 16, 1914. Tonnage produced on lining to Sept. 1, 104,350 tons. Pounds of coke per ton of product, 1,773. Average phosphorus, 0.075. Average manganese, 0.60.
†Banked, Dec. 24, 1913, to Jan. 10, 1914, inclusive. Blown in, Feb. 11, 1912. Tonnage produced on lining to Sept. 1, 448,139. Pounds of coke per ton of product, 1,933. Average phosphorus, 0.074. Average manganese, 0.57.

this benefit is gained at the expense of stove efficiency, because the chief evil has not been removed, namely, the accumulation of flue dust in the stove checkers, which constitutes the greatest impediment to efficiency in stove practice. The only way to eliminate this definitely is to prevent the flue dust from entering the stoves, in other words, to wash the gas thoroughly. It can be considered an established fact that it is impossible to free the gas from its dust content sufficiently by dry-cleaning systems alone, except by filtering. The latter process seems to be rapidly gaining prominence in localities where the water supply is limited. In the majority of cases the washing of stove and boiler gas in towers or rotary machines seems to be the most desirable method from an operating as well as from an economical point of view.

In Mesabi practice, the washing of the gas is specially important and it is incomparably more beneficial than in furnaces melting hard ores. This is mainly for two reasons. By reason of the fineness of the ores and the fast rate of driving customary at Mesabi stacks, the amount of flue dust produced is high, and most of it is a very fine powder, which cannot be eliminated from the gas by any existing dust catcher. Hence the clogging of the checker openings proceeds very rapidly in Mesabi practice. On the other hand, the top temperature of Mesabi furnaces being comparatively low, the loss of sensible heat, which always accompanies the washing of the gas, is reduced to a minimum, and is offset many times by the elimination of the water vapor and the resulting concentration of the combustible constituents of the comparatively lean gas.

The checker openings, which, where unwashed gas is used, are usually 9 inches square, can, with washed gas, readily be reduced to as small a size as the draft will allow. The checker walls, which with unwashed gas, are not considered safe when less than 3 inches in thickness, can now be reduced to the limit set by the size of the checker openings as determined by the proper relation of total brick volume to surface, and by the ability of the brick manufacturer to produce a strong, substantial firebrick. In this way, the heating surface of the checker work is increased, for instance, more than 50 per cent by reducing the checker openings from 9 to 4

(*Continued on page 368.*)

Table II.

HEAT BALANCE SHEET FOR 1 TON OF PRODUCT

Generated. By	B. T. U.	Per cent.
Combustion C to CO	3,995,000	31.1
Combustion C to CO_2	6,754,000	52.6
Hot blast (heat content)	2,057,000	16.0
Moisture of the air in hot blast (heat content)	42,000	0.3
Total	12,848,000	100.0

Consumed. By			B. T. U.	Per cent.
Reduction of Fe_2O_3	6,133,300			
Reduction of Fe_3O_4	490,000	6,623,300		
Reduction of MnO		48,400		
Reduction of P_2O_5		17,000		
Reduction of SiO_2		418,500	7,107,200	55.3
Calcination of carbonates			702,000	5.5
Dissociation of moisture in blast			397,000	3.1
Carried off with the iron			1,142,500	8.9
Carried off with the slag			909,000	7.1
Carried off with the dry top gases			752,400	5.9
Carried off with the moisture in top gas			700,100	5.4
Radiation, cooling water, and unaccounted for			1,137,800	8.8
Total			12,848,000	100.0

Mining Engineers at New York

Many Valuable Papers on Iron and Steel Works Practice Are Read—Blast Furnace Economy and Rail Problems Considered

New York, Feb. 17. (By wire.)—At the banquet of the American Institute of Mining Engineers, W. L. Saunders, new president, was toastmaster. Benjamin B. Thayer, retiring president, announced the gift of $1,000 by Sir Robert Hadfield for essays on engineering subjects.

A NUMBER of valuable papers on blast furnace practice, the steel rail problem and other subjects of interest to the iron and steel industry were read and discussed at the annual meeting of the American Institute of Mining Engineers, held at the Engineering Societies building, New York, during the first three days of this week, Feb. 15-17. The interest centered, naturally, in the session under the auspices of the iron and steel committee on Monday afternoon. The proceedings on this occasion were under the direction of Prof. Albert Sauveur, of Harvard University, chairman of the committee, assisted by A. A. Stevenson, of the Standard Steel Works Co., Philadelphia, vice chairman.

A particularly valuable paper entitled "High Blast Heats in Mesabi Practice" was read by Walther Mathesius, assistant blast furnace superintendent, Illinois Steel Co., South Chicago, Ill. It is printed nearly in full in another part of this issue and points out the necessity for giving careful attention to the design and operating efficiency of hot blast stoves in order to get satisfactory results with high blast temperatures when using Mesabi range ores.

In discussing the paper, H. W. Howland, superintendent of blast furnaces, Wisconsin Steel Co., South Chicago, Ill., laid even more stress than the author on the necessity for improved stove design and efficiency. He pointed out that high stove efficiency is necessary with high blast temperatures and low coke consumption in order to have enough surplus gas available for power purposes. When operating with reduced coke consumption, the amount of gas generated is also reduced, and in some instances, as Mr. Howland pointed out, the saving in coke in the furnace is ineffective owing to the necessity for burning raw coal under boilers to generate steam for blowing engines. He stated that efforts should be made to increase the average stove efficiency from about 50 per cent, where it is today, to about 75 per cent, such a gain in efficiency not being beyond the range of possibility. To support this contention, he cited the results of 50 tests of stove efficiency made by the Wisconsin Steel Co. when operating a furnace with five, four and three stoves. As a result of these tests, it is believed that three-stove operation will be attained with a gain in average efficiency from 44 per cent to 56 per cent. The pressure burner for hot blast stoves, Mr. Howland said, is not per se a gas saver, but it is valuable because it mixes the gas and air thoroughly and correctly and makes it possible to force the combustion of increased quantities of gas in the stove.

Measuring Air in Blowing Tubs

A paper on modern gas power blower stations was presented by Arthur West, of the Bethlehem Steel Co. It was accompanied by lantern slides showing the gas blowing equipment of several American steel plants. Mr. West stated that 11 engines are satisfactory for five furnaces, ten being kept in operation with one held as a spare. At Duluth there are five engines for two furnaces, one being a spare. He also pointed out the accuracy of the blowing tubs on a modern reciprocating engine when used as an air meter. He advocated the use of reciprocating blowing equipment because of the ease with which the amount of air delivered to the furnaces could be measured. He explained, in the course of the discussion, how these measurements can be made by the medium of indicator cards. He also advocated the installation of the Thiessen washers in the blowing engine house, where they can be operated under the supervision of the chief engineer. He said that a reciprocating gas blowing installation of 11 engines for five furnaces can be built for about $400,000.

W. R. Shimer, metallurgist, Bethlehem Steel Co., South Bethlehem, Pa., presented a paper on the effect of the finishing temperatures of rails on their physical properties and microstructure. It is published practically in full in another part of this issue.

G. K. Burgess, bureau of standards, Washington, D. C., and Sir Robert A. Hadfield, London, contributed a paper on sound steel ingots and rails, which is published elsewhere in this issue.

In addition to the iron and steel papers, a large number of papers on general mining topics were read at the several professional sessions on Monday, Tuesday and Wednesday. An interesting entertainment program also was provided, including buffet luncheons at the Engineering Societies building on each of the three days of the meeting, a reception at the home of Senator Clark, a tea dansant at the Plaza hotel and inspection trips over the Catskill aqueduct and the new municipal subway.

The new president of the institute is William L. Saunders, president of the Ingersoll-Rand Co., New York. The new vice presidents are Sidney J. Jennings, consulting engineer, New York, and Philip N. Moore, geologist and mining engineer, St. Louis. New directors are Samuel A. Taylor, Robert W. Hunt, Hennen Jennings, George C. Stone and W. H. Aldridge. Mr. Saunders was inducted into office at the annual banquet Tuesday night.

The total membership of the institute on Dec. 31, 1914, was 4,958, according to the report of the committee on membership. The number of applications during the year was 1.045; the number of persons elected to membership during that period was 921. The report of the committee on papers and publications for 1914 showed that 235 manuscripts were brought before the committee, of which 142 were accepted for presentation at various meetings. The library committee reported the addition to the institute's library during the year of 1,698 books and pamphlets. The treasurer reported receipts during the year of $120,969.81, with a cash balance on hand Jan. 1, 1915, of $8,497.94. The committee on junior members and affiliated socities reported extensive activities during the year, especially in the way of providing educational facilities, such as moving pictures, lectures, etc., for students of mining engineering.

Pump Awarded

St. Louis, Feb. 15.—The board of public service has awarded a contract for a turbine and centrifugal pump to the James Cameron Co. of Pittsburgh. The pump will cost $42,000, and will be installed at the city water works plant. The next lowest bid was submitted by the De Laval Steam Turbine Co. of Trenton, N. J., for about $44,000.

Results With High Blast Heats

(*Continued from page 366.*)

inches, and the thickness of the checker walls from 3 to 2.5 inches. At the same time, this construction eliminates the dead portion of the brick work, in the center of the thicker checker walls, which does not participate in the heat exchange, as is proved by the fact that during the ordinary heating and blowing periods it undergoes hardly any change of temperature.

Stove Operation

With proper equipment and clean gas, stove operation becomes an entirely different problem. It is no longer largely a question of crowding as much gas and air into the stove as possible. The scientific rules of combustion can now be applied, and the stoves can be heated with a minimum amount of gas by complete combustion, proper draft regulation, and an even distribution of the combustion gases and air over the entire heating surface.

Very efficient burners of a modified Bunsen type have recently been introduced, which, without being complicated in design, give an excellent mixture of air and gas. They utilize the method of first mixing primary air and gas outside of the stove before the point of combustion is reached, and then introducing the secondary air in the proportion required for complete combustion. In this manner a high flame temperature is reached, and all of the carbon monoxide is burned with a much smaller excess of air than is possible with the ordinary type of burner. However, where the size of stoves is entirely inadequate, or relining is not possible in the immediate future, a new method of forced combustion is suggested as the proper solution.

This method, originating in Germany, and now being tried at several American plants, consists of blowing air into the gas burner with sufficient force so as to burn the mixture of gas and air under pressure within the stove. This not only insures a quicker combustion, but also causes a much greater volume of gas and air to enter the stove than could be drawn in by the chimney draft alone. It is claimed, and experiments tend to show, that in this manner practically as much heat can be stored in the stove in one hour as can be taken out by the blast in the same length of time. If this claim can be established, it is evident that radiation losses will be greatly reduced, since only two stoves in place of the present four would be required. The cost of installing and operating a fan appears to be a very small item, when compared to the first cost, repairs and maintenance of two hot-blast stoves.

But the installation of a good stove burner is by no means the cure of all evils. Its proper operation is at least equally important. Weather and draft conditions, the composition and pressure of the gas, and the temperature within the stove, all of which are subject to considerable changes, are vitally influential. Constant watchfulness on the part of the furnace management and crews is required to keep the three variables, gas, air and draft, always properly adjusted. The importance of strict supervision cannot be over-estimated, and this should be facilitated as much as possible by frequent gas analyses, accessible and easily readable gas-pressure gages, recording stack-temperature pyrometers, and convenient means of observing the development of the flame in the combustion chamber. The aim should always be to complete the combustion in the lower part of the chamber; the shorter the flame, the higher will be its temperature, and the brighter also the appearance of the combustion chamber walls, which can readily serve as a guide for the operator. If the combustion chamber is roomy enough to permit a free development of the flame, the danger of overheating and melting the parts of the walls opposite the burner is remote.

Proper combustion having been achieved, the next step is to distribute the gases correctly over the entire heating surface, and to bring them into the closest contact with the brick work, there to give off their heat as uniformly and completely as possible.

To facilitate proper gas distribution, many arrangements have been proposed and applied to the original designs of both side and center-combustion stoves. Most of these devices, even if correct in principle, have achieved but little, so long as unwashed gas was used. The deposition of flue dust on top of the checker work would, in the course of a few weeks, bring gas circulation to a complete standstill in a large percentage of the checker openings. Through the remainder of the openings the gas would flow with increased speed, passing only a small part of the total heating surface with little chance for proper heat exchange, and with correspondingly high stack temperature as a result. One can readily see that, under such conditions, any attempts to improve the draft distribution by more adequately spacing and dimensioning the stack valves, by the reduction of the checker openings in such parts of the stove cross-section as are favored by the draft, by the altering of the dome-shape, would avail little—the deposition of flue dust being, in spite of all, and above all, the predominant factor influencing the draft and the gas distribution.

With the introduction of washed gas, this condition is changed completely. The checker work can now be relied upon to retain its original free area throughout a whole furnace campaign, or at least for a number of years. The proper distribution of the gas and the correct regulation of the draft now becomes a problem of the utmost importance. Researches which have been carried on in recent years seem to indicate that on a large number of stoves the deficiency in this respect is serious, affecting in some cases over 50 per cent of the total heating surface. Such conditions can now be readily and reliably investigated and adjusted. The means to be employed to this end have been indicated above and depend almost entirely on local conditions. At present a large number of furnace managers are giving this subject their special attention; and, since the goal to be attained is well defined, considerable progress in this direction may be expected in the near future.

The exceedingly favorable practice which has been obtained recently on Mesabi furnaces by the use of higher heats, lends new and special interest to the theoretical side of the fuel-economy question. Research along these lines has so far not been very extensive in Mesabi practice; and it is to be hoped that the recent practical progress will give a new impulse also to scientific investigations.

Examinations of existing furnace conditions in different localities appear to be of first importance; and as a contribution of this character, a thermal analysis has been prepared of the performance of No. 4 blast furnace at the South works of the Illinois Steel Co., during the month of June, 1914. It is hoped that this attempt will invite discussion and research along similar lines, and thus do its share toward throwing some light on the question, to what extent, under modern conditions, the various reactions in the blast furnace influence the equilibrium between heat supply and demand, and through this the fuel economy.

The heat balance of this furnace is given in Table II.

Comparison Test of Rail Ingots

Interesting Details of Experiments at Sparrows Point on Treated and Untreated Ingots—Commercially Possible to Obtain Sound Steel

BY GEORGE K BURGESS AND SIR ROBERT A HADFIELD

IT IS the purpose of this paper to compare the properties of rails rolled in one mill according to American practice, with several types of ingot of substantially the same chemical composition but cast by several processes; and to compare in considerable detail the properties of an ingot manufactured by the Hadfield special-feeding process and one of the usual type for rolling into rails. We are greatly indebted to F. W. Wood, president of the Maryland Steel Co., who made this investigation possible by kindly placing his rail mill at our disposal; and he and his associates at Sparrows Point did everything to make the experiment a success, including the execution of several of the tests and analyses.

Of the ingots used in this investigation, eight were made in Sheffield and furnished by Sir Robert Hadfield, and one was made and furnished by an American steel company, as a comparison ingot, and was supposed to represent the usual type of ingot from which rails are made.

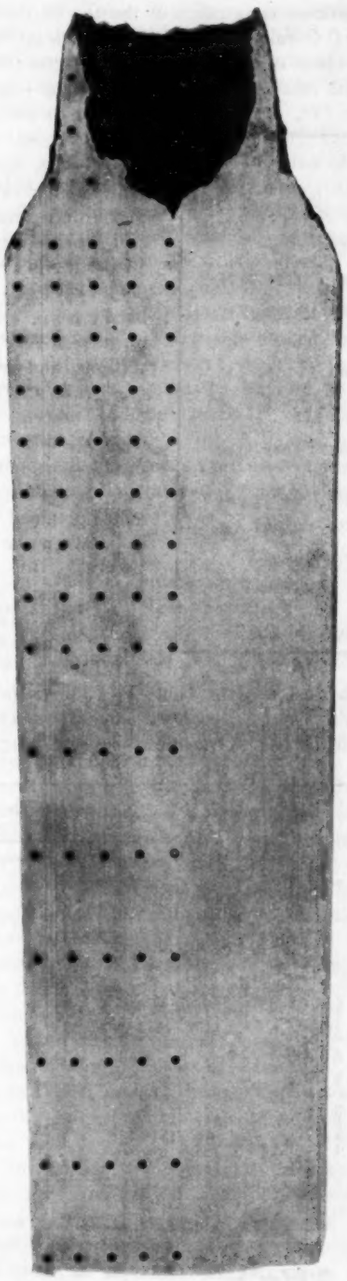


FIG. 1 — SPLIT HADFIELD INGOT SHOWING SOUND STEEL AND LOCATION OF DRILLINGS

Kinds of Ingots Used

The characteristics of the ingots are given in Table I. Ingots 1, 2, 3, and 4 were cast large end up and fed by the Hadfield method in the usual manner with charcoal and blast continued until the molten steel has set on the top of the head, say varying from 20 to 40 minutes. To ingots 1, 2, and 4 was added 0.1 per cent aluminum, and to the nickel-chrome ingot, No. 3, 0.125 per cent. For sake of comparison, there were also included two ingots, Nos. 8 and 9, cast with the small end up and fed by the Hadfield process; three ingots not fed, two of piping steel, Nos. 6 and 10, and one of rising or "unsound" steel, No. 7. The Hadfield ingot No. 1 and the American comparison ingot, No. 10, were cut up for examination as to segregation, blowholes, and piping, while the others were rolled into rails. It was expected that ingots Nos. 2, 3, and 4 would give rails of a uniform quality throughout nearly the whole length of the ingot, and that No. 1, which was selected by chance from the specially fed ingots cast large end up, would show a uniform, sound structure throughout. Previous experience has shown that ingots of the type of Nos. 8 and 9, cast by the Hadfield process with small end up, would be expected to be less satisfactory than the Hadfield type represented by Nos. 2, 3, and 4, cast with large end up. The former sometimes show a tendency to develop a pipe at the lower end. Ingot No. 6 would be expected to show piping and segregation, and No. 7 segregation and unsoundness; for both of these ingots a much greater waste would be expected than for the specially fed ingots.

At the Pittsburgh laboratory of the

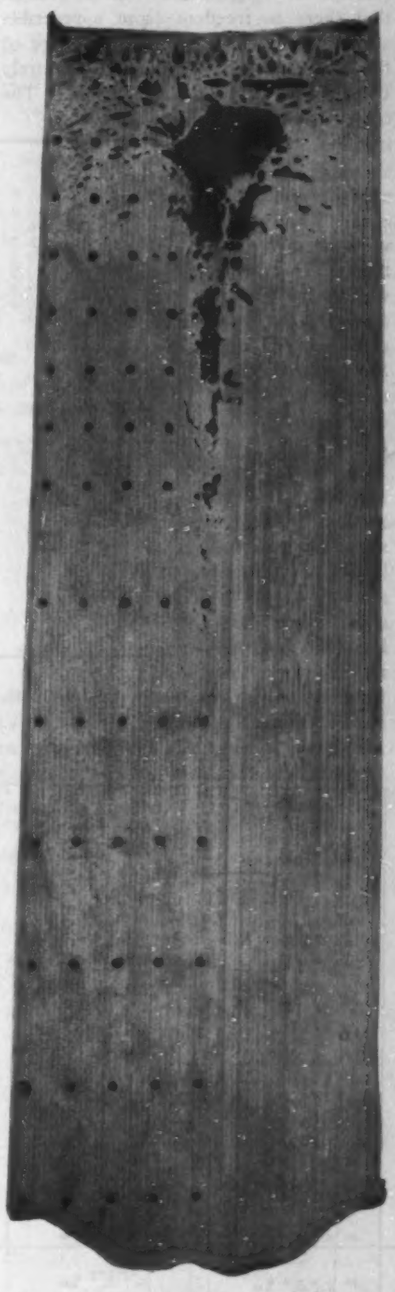
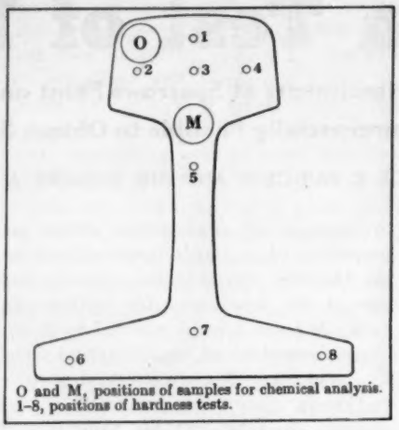


FIG. 2 — SPLIT COMPARISON INGOT SHOWING PIPE AND THE LOCATION OF THE DRILLINGS

A paper presented at the February meeting of the American Institute of Mining Engineers.

bureau of standards two of the ingots were sawed in halves—Hadfield No. 1, of the specially fed type cast large end up, and the comparison ingot, No. 10, from an American mill. Figs. 1 and 2 show the location of drillings and a comparison of the interiors of the two ingots. The ingot made by the Hadfield process was also smoothed off in order to take a sulphur print. In Figs. 4, 5 and 6, respectively, are shown the segregation of carbon, phosphorus, and sulphur for each of the ingots. A similar survey was also made for manganese, with no considerable segregation of this element in either ingot. It is evident that there is freedom from appreciable segregation over 95 per cent or more of the Hadfield ingot, which is also entirely free from piping or blowholes. The comparison ingot, if rolled into rails, should have about a 50 per cent discard. The ingots were charged into the soaking pits, which had been allowed to cool considerably, on Sunday evening, and rolled Monday, Apr. 13, 1914, at 8 a. m., into 100-pound Pennsylvania standard section rails, the seven ingots being interpolated among other ingots. In the Maryland mill the rolling from ingot to finished rail is a continuous process without reheating the blooms. In Table VI are shown some of the characteristics of the rolling. Apparently through a misunderstanding of instructions and unfamiliarity with this type of ingot, the top bloom crops of the first two rolled, specially fed Hadfield ingots Nos. 2 and 3, were excessive, at least double what was necessary to carry the blooms through the rail mill. The other Hadfield and comparison ingots were sheared as instructed. The *A* rail was made the short rail, usually 6 to 10 feet long, to be examined as to soundness. The drop-test specimen was cut next the bottom of this short *A* rail, a 13-inch specimen for tensile tests from the head of the *C* rail, and 3-inch pieces for chemical, metallographic, and hardness tests from the heads of the *A*, *B*, and *C* rails.



O and M, positions of samples for chemical analysis. 1-8, positions of hardness tests.

FIG. 3—RAIL SECTION
O and M show positions of samples for chemical analysis; 1-8, show positions of hardness tests

In Table V are shown the Brinell hardness tests taken at the top of the *A* and *C* rails for position shown in Fig. 3. It is of interest to note that the tests, with the exception of those on rails with a pipe or seam (from ingots Nos. 6, 8, 9) show a high value of hardness numeral for position 5 in the *A* rail. Otherwise the hardness is quite uniform over the sections, and from one rail to another, except, of course, for the nickel-chromium, No. 3. The results obtained by the Maryland Steel Co. for the drop tests are shown in Table III; of inspection in Table VI; physical tests in Table IV; and chemical analysis for carbon in Table II in which the *O* and *M* positions refer to Fig. 3.

Table I.

CLASSIFICATION OF INGOTS

No.	Size, in.	Wgt., lbs.	Method of casting.	Type of Steel.	Chemical analysis C.	Mn.	S.	P.	Si.
1	18	5,964	Hadfield system, large end up.	Ordinary rail steel.	0.59	0.97	0.041	0.031	0.21
2	18	6,006	Hadfield system, large end up,	Ordinary rail steel.	0.55	0.96	0.043	0.029	0.12
3	18	5,900	Hadfield system, large end up,	Nickel-chromium steel.	0.25	0.38	Ni3.70	Cr1.47	0.19
4	18	5,850	Hadfield system, large end up,	Ordinary rail steel.	0.56	0.92	S0.040	P0.035	0.19
6	18	5,200	Ordinary manner, small end up.	Ordinary rail steel which pipes, not fed.	0.56	0.94	0.060	0.051	0.20
7	18	5,100	Ordinary manner, small end up.	Ordinary rail steel of rising or boiling nature, not fed.	0.57	0.95	0.080	0.045	0.20
8	18	5,700	Hadfield system, small end up.	Ordinary rail steel.	0.58	0.96	0.070	0.051	0.23
9	18	5,700	Hadfield system, small end up.	Ordinary rail steel.	0.59	0.96	0.054	0.040	0.20
10	19	.....	The American ingot, cast in ordinary manner, small end up.	Ordinary rail steel.	0.46	0.94	0.05	0.09	....

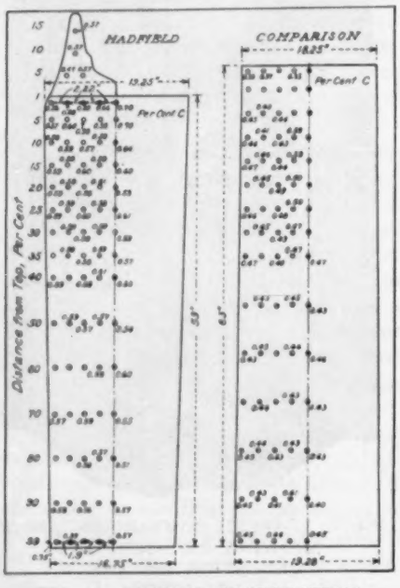


FIG. 4—CARBON SEGREGATION

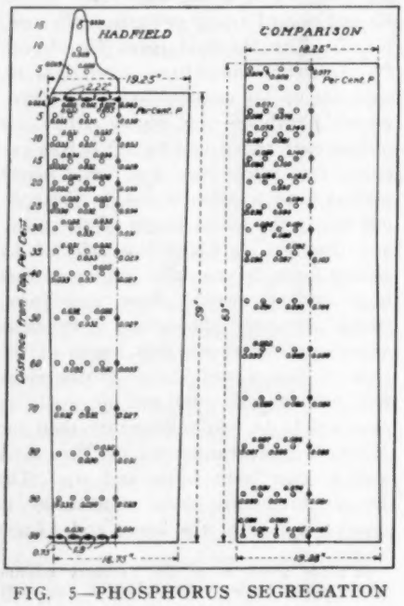


FIG. 5—PHOSPHORUS SEGREGATION

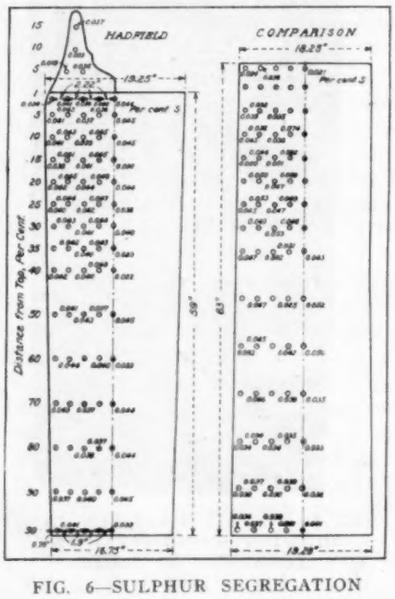


FIG. 6—SULPHUR SEGREGATION

The *O* and *M* analyses for all the elements and for the *A*, *B*, and *C* rails will be given in the complete paper.

Figs. 7, 8, 9, and 10 are characteristic sulphur prints of rail sections for each type of ingot. For all the Hadfield ingots cast large end up the rail microstructure is very uniform even over the web for the front end of an *A* rail, as here shown. Rails from both the Hadfield ingots cast small end up show a very different microstructure from the first group. The center streak of Fig. 10 has the appearance of nearly pure ferrite under the microscope; this corresponds also to the hardness examination of Table V. It is interesting to note that the pipe of ingot No. 6 cast in the ordinary way is not accompanied by any considerable segregation. This pipe extends well into the *C* rail even after a top bloom discard of 13 per cent, confirming the characteristics of the split comparison piping ingot No. 10 mentioned above. In the complete paper the microstructure will also be reported in detail.

From the several tables of tests and from the metallographic examination it is seen that the percentage of ingot available for sound rails of uniform homogeneous structure is 91, 90, and 88 respectively for the specially fed ingots cast large end up, Nos. 2, 3, and 4, as compared with much less percentages of sound ingot metal usually available.

General Conclusions

In all, nine ingots were used in this investigation; eight furnished by Sir Robert Hadfield, all but one of which had approximately the same chemical composition. The examination of the split ingots shows the great superiority of casting large end up and feeding by the Hadfield special process, such an ingot being physically sound and uniform throughout and practically free from chemical segregation. The examination of the rails shows that for ingots cast by the Hadfield process, those cast large end up will give rails of uniform quality free from flaws of all kinds; those cast small end up may show a soft region in the web of the *A* rail but are otherwise sound.

Those which were cast in the ordinary manner from piping or otherwise unsound steel may or may not give sound rails, depending upon the condition of the steel.

In addition to the certainty of producing all sound rails by the special-feeding process from ingots cast large end up, there is a great saving in metal and a consequent increase in percentage of sound ingot available for rails—in these experiments an average of 90 per cent for ingots Nos. 2, 3, 4, as compared with about 50 per cent for the piping ingot and an uncertain amount from the rising type.

The usual physical and chemical tests do not appear to give an adequate measure of the quality of rails. For example, the results of the tensile and drop tests and chemical analyses would not separate the sound from all the unsound rails here examined.

The question may be asked, is it not worth while to use, in the manufacture of rails, only sound steel which is cast and rolled in such a manner as to make practically every rail a sound and safe

Table II.

CARBON ANALYSIS OF RAILS TO SHOW SEGREGATION

O and M positions of Fig. 3 for tops of A, B, and C rails

Ingot No.	A-O.	A-M.	B-O.	B-M.	C-O.	C-M.	Method of casting.
2	0.540	0.612	0.560	0.556	0.570	0.588	Large end up; special feeding.
3	0.278	0.290	0.250	0.270	0.240	0.272	
4	0.550	0.640	0.560	0.580	0.612	0.580	
6	0.528	0.584	0.536	0.552	0.560	0.558	Small end up; ordinary piping steel.
7	0.550	0.648	0.570	0.598	0.578	0.568	Ordin. rising steel.
8	0.530	0.640	0.570	0.662	0.578	0.588	Special feeding.
9	0.598	0.640	0.580	0.600	0.576	0.588	

Table III.

DROP TEST RESULTS

100-lb. P. S. section; 3-ft. supports; weight of tup, 2,000 lb.; fall, 15 ft.

Ingot No.	Blow.	Per set.	Elongation on base: 1st in.	2nd in.	3rd in.	4th in.	5th in.	6th in.	Total.
2	First	1.1	0.03	0.04	0.05	0.05	0.04	0.03	6.24
3	First	0.8	0.03	0.04	0.05	0.05	0.04	0.03	6.24
4	First	1.1	0.02	0.04	0.05	0.05	0.04	0.02	6.22
6	First, pipe at frac.	1.0	0.02	0.03	0.04	0.04	0.03	0.02	6.18
7	First	1.0	0.02	0.03	0.04	0.04	0.04	0.03	6.20
	Second	1.9	0.03	0.04	0.06	0.06	0.06	0.06	6.31
8	First, pipe at frac.	1.0	0.02	0.04	0.05	0.05	0.03	0.03	6.22
9	First	1.0	0.02	0.03	0.05	0.05	0.04	0.03	6.21

Table IV.

RESULTS OF TENSILE TESTS CUT FROM CENTER OF HEADS OF C RAILS

Ingot No.	Yield point* lb. per sq. in.	Ultimate strength, lb. per sq. in.	Elongation per cent in 8 in.	Reduction of area.	Fracture per cent.
3	98,700	177,300	9.75	27.3	100 silk, cup and cone
2	69,100	119,600	14.00	25.2	10 silk
4	69,000	118,600	12.00	26.0	10 silk
6	69,300	119,300	14.00	27.3	10 silk
7	67,000	120,600	11.75	23.6	10 silk
8	69,000	119,600	12.00	20.4	10 silk
9	68,000	119,000	11.75	20.4	10 silk

Ingot No.	Analysis† C.	Mn.	P.	S.	Si.	Cr.	Ni.
3	0.268	0.41	0.034	0.043	0.195	1.44	3.65
2	0.562	0.99	0.033	0.047	0.169	....	....
4	0.570	0.90	0.040	0.046	0.197	....	....
6	0.580	0.90	0.052	0.054	0.197	....	....
7	0.618	0.93	0.053	0.066	0.197	....	....
8	0.598	0.94	0.041	0.070	0.216	....	....
9	0.610	0.98	0.044	0.057	0.226	....	....

*Yield point found by use of dividers and running the machine back until the point was found where there was a permanent stretch.
†Analyses shown are from drillings taken from pulled tensile specimens.

Table V.

BRINELL HARDNESS NUMERALS

Ingot.	Rail.	Hardness Numeral in Kg. Per Sq. Mm. for Positions. 1	2	3	4	5	6	7	8	Mean.	Average deviation.
2	A	250	253	250	251	272	258	258	251	255	±5.4
2	C	258	254	253	259	260	259	256	254	257	2.4
3	A	366	347	374	351	398	362	359	359	365	11.2
3	C	351	351	364	351	360	351	351	351	354	4.2
4	A	244	241	253	247	295	246	252	250	253	10.0
4	C	251	251	253	254	253	251	251	251	252	1.1
6	A	248	244	254	251	251	251	252	241	249	3.5
6	C	248	252	256	250	245	246	255	252	251	3.2
7	A	248	250	262	256	276	251	245	239	253	8.5
7	C	248	260	254	262	251	251	255	248	254	4.1
8	A	250	248	260	248	218*	258	260	254	250	8.5
8	C	254	258	264	251	279	261	263	263	262	5.6
9	A	248	251	251	245	236*	255	264	260	251	6.2
9	C	260	258	260	262	264*	264	264	263	262	1.9

*Seam through indentation.

Table VI.

ROLLING AND INSPECTION OF INGOTS AND RAILS.

Number of ingot.	3	2	4	6	7	8	9
Taken from pit at	8 hr. 9 min.	8 hr. 40 min.	8 hr. 55 min.	9 hr. 11 min.	9 hr. 27 min.	9 hr. 43 min.	10 hr. 45 min.
Time in blooming mill	1 min. 40 sec.	1 min. 40 sec.	1 min. 42 sec.	1 min. 30 sec.	1 min. 40 sec.	1 min. 30 sec.	1 min. 40 sec.
Average temperature of ingot in blooming mill, degrees Cent.	1,100	1,115	1,110	1,110	1,135	1,150	1,125
Time blooming mill to hot saw	3 min. 50 sec.	4 min. 10 sec.	3 min. 23 sec.	4 min. 5 sec.	3 min. 20 sec.	3 min. 15 sec.	3 min. 22 sec.
Average temperature first rail bar at hot saw, degrees	950	960	970	970	970	980	980
Average temperature second rail bar at hot saw, degrees	945	900[1]	950	945	955	970	965
Top bloom butt, per cent of ingot	4.2[2]	5.6[2]	7.8	12.9	5.0	5.1	6.3
Total bloom butts, per cent	7.2	7.4	9.7	14.7	8.0	6.8	8.3
Oxidation loss, per cent[4]	1.3	2.7	1.9	2.9	3.5	3.5	2.5
Percentage of ingot available for rails	91.5	89.9	88.4	82.4[3]	88.5	89.7	90.2
Rails: Percentage of firsts	77.2	77.1	52.5	9.5	54.3	51.9	28.5
Percentage of seconds[5]	22.8	22.9	47.5	90.5	27.4	48.1	23.8
Percentage of scrap[6]	....	....	....	....	18.3	....	47.7[5]
Type of ingot	Special feed, large end up			Ordinary piping	Ordinary rising	Special feed, small end up	

[1]Was held back before coming to saw.
[2]Has been corrected as explained on page 370.
[3]Contains pipe, however, extending into *C* rail.
[4]It is to be kept in mind that all are reheated ingots.
[5]Two rails, *C* and *D*, from middle of ingot were scrapped for mechanical defects.
[6]This classification includes, of course, defects due to mill practice.

one? We believe this can be done without excessive cost.

We are greatly indebted for valuable assistance from several members of the staff of the bureau of standards, particularly Messrs. Hillebrand, P. H. Bates, Rawdon, Witmor and Devries. We also take this opportunity of thanking Mr. Milne and Mr. Dawson, of Sheffield, England, for their share in this research and for the care and attention bestowed by them upon the work.

Large Cooper Engine Installations

Numerous large installations of Cooper gas engines are illustrated in a 12-page bulletin issued by the C. & G. Cooper Co., Mt. Vernon, O. One of the largest installations shown consists of three 21½ x 42-inch twin tandem, double-acting Cooper gas engines, direct-driving high and low pressure gas compressors, at the Taft, Cal., station of the Southern California Gas Co. These units deliver 30,500,000 cubic feet of free gas in 24 hours against a delivery pressure of 450 pounds. Illustrations are shown of a plant installed at the Pavonia, O., station of the Logan Natural Gas & Fuel Co. consisting of a 24 x 48-inch twin tandem, double-acting Cooper gas engine, direct-driving gas compressors. This unit delivers 17,400,000 cubic feet of natural gas per day. At the Bigheart, Okla., station of the Wichita Pipe Line Co., three Cooper gas engines have been installed with direct-drive gas compressors, the units delivering 40,000,000 cubic feet of free gas in 24 hours against a delivery pressure of 350 pounds.

At the Perrysville, O., station of the Ohio Fuel Supply Co. the Cooper company is installing three 21½ x 36-inch single tandem, double-acting Cooper gas engines for direct-driving gas compressors. These units will deliver 19,500,000 cubic feet of free gas in 24 hours. This is the second installation of Cooper engines made by the Ohio Fuel interests. At the Branchland, W. Va.,

FIG. 7—SULPHUR PRINT OF A-RAIL FROM INGOT NO. 2 SPECIALLY FED AND CAST LARGE END UP

FIG. 8 — SULPHUR PRINT OF A-RAIL FROM ORDINARY INGOT — THE PIPE SHOWN EXTENDS INTO THE C-RAIL

FIG. 9—SULPHUR PRINT OF A-RAIL FROM INGOT NO. 7 CAST IN ORDINARY MANNER FROM RISING STEEL

FIG. 10—SULPHUR PRINT OF B-RAIL FROM INGOT NO. 8, SPECIALLY FED AND CAST SMALL END UP

station of the Columbia Gas & Electric Co. the Cooper gas engine installation consists of two 21½ x 36-inch single tandem, double-acting units, direct-driven gas compressors, and delivers 13,000,000 cubic feet of free gas in 24 hours.

At the station of the Medina Gas & Fuel Co., Mansfield, O., 21½ x 36-inch single tandem, double-acting engines have been installed which direct-drive high pressure gas compressors. These units distribute 13,000,000 cubic feet of natural gas per day. A twin tandem unit of this same capacity is now being installed in this station.

Other installations illustrated in this bulletin follow: A 21 x 30-inch single tandem, double-acting gas engine, driving cross-connected air compressor cylinders; this machine is installed in the power plant of the Ralston Steel Car Co., Columbus, O., and has a capacity of 1,740 cubic feet of free air per minute at 100 pounds pressure. Two 19 x 24-inch single tandem, double-acting gas engines, direct-driving two-stage air compressors, at the plant of the B. B. Stroud Co., Bradford, Pa.; this plant has a capacity of 3,522 cubic feet of free air per minute, delivered at 100 pounds pressure to engines in the field for pumping oil wells. Two 18 x 24-inch single tandem, double-acting gas engines, driving direct current generators at the plant of the Northwestern Ohio Natural Gas Co., Sugar Grove, O.; these units furnish current to drive all auxiliary machinery and provide light for a large compressor station. Two 24 x 30-inch single tandem, double-acting gas engines, driving direct current generators; these units operate the plant of the Owens-Eastern Bottle Co., Clarksburg, W. Va., and are in continuous 24-hour service alternately for two to three-week periods. Two 21½ x 36-inch single tandem, double-acting engines each direct-connected to a 350-kilowatt generator, installed in the plant of the Charles Boldt Co., Huntington, W. Va.

The Selling Price of Castings

BY W A HERRON

THE COST of producing castings is a vital one to all foundrymen, and the adoption of some simple and reasonably accurate method of determining costs is much to be desired. Some years ago the Steel Founders' Society attempted to solve this problem by the employment of expert accountants, who proposed a system of cost keeping that was so elaborate that it failed of anything like general adoption. It was not simple enough to meet the needs of every-day practice.

It is, of course, desirable that monthly detailed records of expenses be kept for all departments of a foundry so as to facilitate the location and elimination of excessive items of cost and to provide a basis for accurate departmental and individual casting costs, but for estimating purposes a method so simple that any one whose duty it is to make quotations shall have a reasonably accurate basis of calculation, is needed. And in considering any such system, it should be borne in mind that by any method the ascertainment of costs in a foundry is necessarily more or less approximate, because the factors entering into the cost are continually changing.

It is only a question then of devising a reasonably close approximation, and this can be done in the following manner: The total expenses for a month, or for such period as the method of accounting in use may admit of, less the general expenses and the cost of metal in the ladle, are divided by the total number of hours, or days, worked by molders during the same period. This gives the cost of maintaining a molder per hour, or per day. When this cost is ascertained, it is only necessary to know the daily output of good castings of the molder to get the cost of the casting, exclusive of general expenses and metals. When these items are added, the total cost is known. Assuming that it costs $2.00 per hour to maintain a molder and that he molds 1,000 pounds in five hours, the cost would be 1 cent per pound, to which must be added the cost of the melted metal and the general expenses.

The increasing interest taken by foundrymen in the question of determining costs in the foundry, is shown clearly by the comments received on the article by A. O. Backert, published in THE IRON TRADE REVIEW, *Jan. 28, discussing "The Selling Price of Castings." The method of determining selling prices given by Mr. Herron in the accompanying article deserves careful attention.*

After this record has been kept for some time, an average rate for a molder's hour will be ascertained which can be generally used. The cost of melted metal varies, of course, with the market, but the record of one month can be used for the month following. The item of general expense, of course, fluctuates widely with the output of the foundry, and figures representing normal conditions should be used at all times.

When the approximate cost is ascertained, another factor of equal importance must be considered and that is the state of the market. In lean times, when competition is keen, it is largely a question of how much the customer will pay, but it is a satisfaction to know the point below which it is impossible to go without loss.

The author, W. A. Herron, is president of the Duquesne Steel Foundry Co., Pittsburgh.

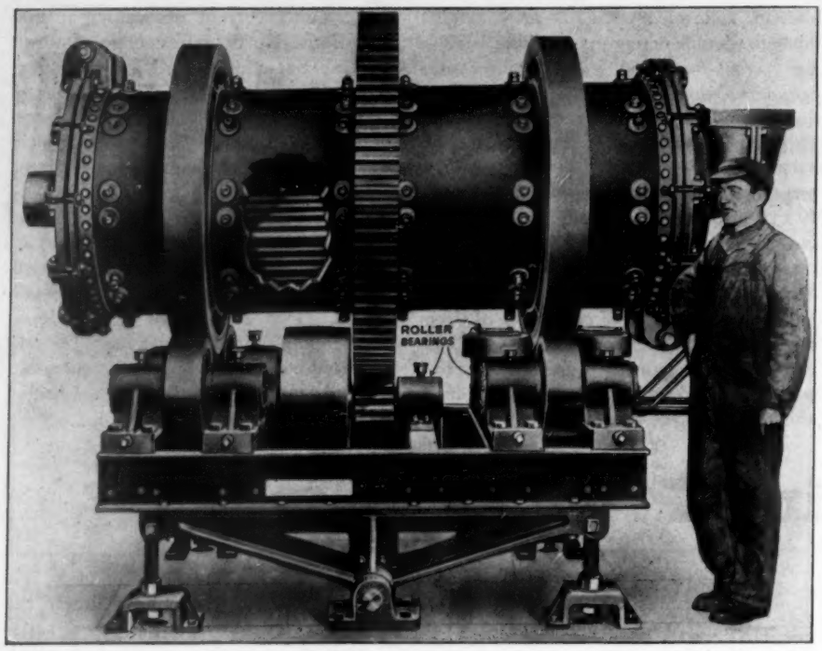
Gasoline Crane

The Industrial Works, Bay City, Mich., has developed a small locomotive bucket crane operated by a gasoline engine. It is especially adapted for light or intermittent work, such as handling coal, ashes, etc., or for service in places where the use of steam is objectionable. A crane of this type, it is said, has a further advantage of being always available for immediate use without waiting to get up steam. In operation it should be exceedingly economical, as there is no waste or fuel when the crane is not actually working.

Large Rim Order

The Standard Welding Co., Cleveland, has received one of the largest orders ever placed for demountable rims for the Willys-Overland Co., Toledo, O. The order specifies the delivery of nearly 500,000 demountable rims during the year 1915, for new Overland cars. To produce this quantity more than 5,000 tons of steel will be consumed.

The Atlas Car & Mfg. Co., Cleveland, has issued a bulletin describing its line of storage battery locomotives and cars. The details of locomotives for mining and industrial service are fully covered. Storage battery tractors for manufacturing plants also are described, together with generating sets for charging storage batteries and other special equipment including a storage battery crane truck.



SELF CONTAINED GRINDING MILL

Ore Grinding Mill

A mill for grinding ore, coal and brick-making material has been put on the market recently by the Johnson Engineering Works, First National Bank building, Chicago. It is the invention of Ernest C. Johnson, president of the company. The accompanying illustration shows the construction of the mill. It consists of a cylinder in which are placed steel rods as long as the cylinder. Attrition of the material on itself and from the pressure of the rods as the cylinder is rotated is said to reduce the material to any required degree of fineness.

A motor and pinion convey power to the gear about the center of the cylinder and the weight is borne by bearings turning on small wheels at either end. To prevent the cylinder from moving longitudinally horizontal retaining wheels are utilized. The bed frame is supported at the middle point on each side and at each corner is a screw adjustment by which the mill may be tilted, the inclination determining the speed at which the material being ground passes through, thus giving control of the degree of grinding.

The steel rods which supply the grinding members are five inches in diameter when placed in the cylinder and can be used until they are reduced to ¼-inch diameter. The original weight of the rod is 66¼ pounds per foot and the wastage weighs 1/6-pound per foot. Small expenditure of power in operation is claimed, the horsepower per ton of material handled being dependent on the fineness obtained.

The mill is said to be adapted for concentrating low grade iron ores, handling the material in large quantities, and for pulverizing coal to a degree suitable for use in furnaces with an air blast.

This requires pulverizing to 100 or 200 mesh. It is also used for preparing copper and other ores for smelting, taking the place of the old-style stamp mills. By varying the feed and inclination of the mill it is said work can be done ranging from breaking up material into large pieces to reducing it to flour and either wet or dry grinding can be performed without a change in the mill or its adjustments.

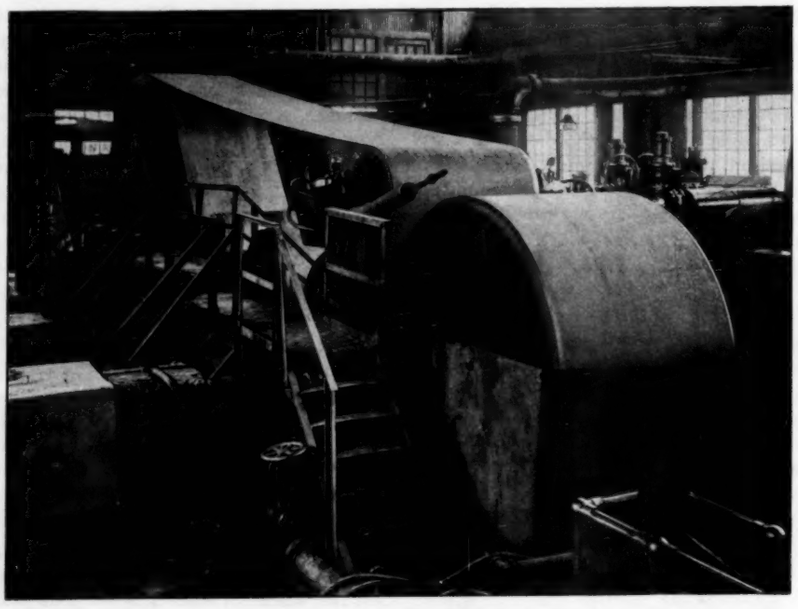
Unusual Belt Drive

Despite the increasing use of individual motor drive for all classes of machinery, leather belting continues in demand for use in steel mills and machine shops. In some instances, it has been found that belts will perform certain heavy duties in steel mills more satisfactorily than any other type of drive. In this connection, an interesting example is shown in the accompanying illustration. This belt is used to drive a skelp mill under severe service conditions, and after four years of continuous operation is giving complete satisfaction. The belt is 60 inches wide, 3-ply, 145 feet long and was installed by the Graton & Knight Mfg. Co., Worcester, Mass.

The belting now used in increasing quantities is largely in the smaller sizes for driving individual tools, but the example given demonstrates that there are occasions when the large size belt drive will give a service equal to any type of individual drive.

The Giddings & Lewis Mfg. Co., Fond du Lac, Wis., has shipped the first two automatic six-spindle lathes of a new type which it has been developing. Large production is planned and it is said that satisfactory orders have been booked from domestic consumers.

Leaflet No. 3767 recently issued by the Westinghouse Electric & Mfg. Co., Pittsburgh, covers magnet switch starters for alternating-current motors with squirrel cage and slip ring rotors. This type of switch is thoroughly described and illustrated in the leaflet.



BELT DRIVE IN SKELP MILL

Mine Accidents from Rock Falls

More Fatalities in Metal Mines Result From Falls of Rock or Ore Than From Any Other Cause

BY EDWIN HIGGINS

MORE men are killed and injured in the metal mines of the United States from falls of rock or ore than from any other cause. According to the bureau of mines, there were employed in and about metal mines during 1912, a total of 169,199 men. Of this number 110,056 worked underground and 59,143 on the surface. There were 661 fatal accidents, 522 underground and 139 on the surface. Of the fatal accidents, 212 were caused by falls of rock or ore, this number representing 32.1 per cent of the total number of men killed on the surface and underground, and 40.6 per cent of the number killed underground.

Copper mines showed the largest percentage of men killed from falls of rock or ore; iron mines came second. Lead and zinc mines showed about the same percentage of fatalities as gold and miscellaneous metal mines, and were third in order. These figures indicate that the greatest number of accidents from falls of rock or ore occur in ore bodies of great width. For the sake of brevity, the word "falls" will be used instead of "falls of rock or ore."

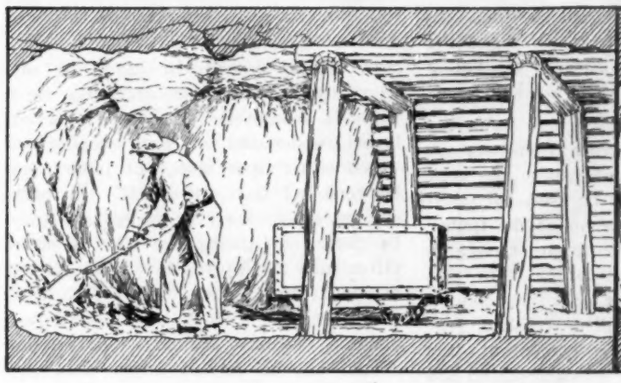


FIG. 1—MUCKER WORKING AT FACE WITHOUT INSPECTING BACK

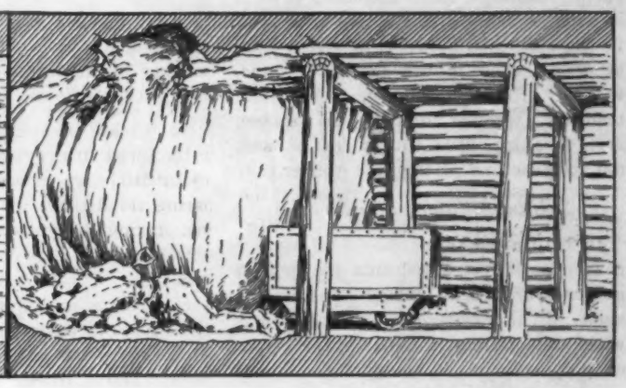


FIG. 2—MUCKER CRUSHED UNDER FALL OF ROCK

What the Underground Worker Can Do

Even if it were possible, it would serve little purpose to point out just what proportion of accidents from falls is blamable to the management and what to the miner. However, the writer, who has been a worker underground, believes that the problem of preventing accidents from falls is almost wholly in the hands of the miner. A mine equipped with thousands of dollars worth of safety devices and worked by careless or indifferent miners will have more accidents than a mine without a single safety device but with miners who are always thinking of preventing accidents to themselves and their fellow workmen.

A careful study of many accidents from falls indicates that a large proportion of the accidents might not have happened if the miner or the underground boss had used more judgment or care. Of course, many falls are unforeseen, such as those caused by the movement of a large block of ground, or by the falling of ground that even the most experienced miner would have no reason to believe unsafe. If a miner persists in taking chances and in disregarding his own judgment, or that of others who know, he is liable to be injured. If the underground boss fails in his duty as an inspector, or in compelling his men to obey orders promptly, he is responsible to that extent for accidents to men under his charge.

Ignorance of the nature of the ground or of the proper method of timbering is not a reasonable excuse for accidents from falls. If a miner does not know the ground where he is working, there are ways for him to find out about it. If he does not know how or where to place timber, he may readily find some one to show him. The experienced miner who is hurt by a fall will find, in most cases, that the accident would not have happened if he had been more careful or if he had followed his best judgment.

It lies within the power of the underground worker to reduce greatly the number of accidents from falls. The exercise of this power is a duty that every miner owes to himself and to his fellow workmen. The management of a mine is human, as is the miner, and therefore makes mistakes. Above all things the management needs the assistance and co-operation of the miner; without it little progress can be made toward lessening the number of accidents from falls.

Ore deposits vary greatly in size, shape and occurence. They may occur in veins, beds, masses, shoots, or irregular pockets; they may be flat, sloping or vertical. Gold-bearing quartz veins an inch wide are profitably mined in the western part of the United States; on the other hand, some of the iron-ore deposits of the Lake Superior district are 500 feet wide. Some classes of ore deposits are found only at or near the surface; others extend a mile or more underground.

In metal mines the ore may vary from ore that is as soft as mud to ore so hard that sparks will fly when it is drilled, and the same is true of the walls or rock surrounding the ore. In some mines work is carried on in ground that must be supported by rock walls several feet thick. In other mines, when drifting in wet and heavy ground, it is necessary to "spall" or "forepole" and place heavy timber sets with no space between them.

Causes and Prevention of Accidents

Accidents from falls are many and varied in their nature, depending on the kind of ground worked. They include accidents due to the dropping of small pieces of rock or ore, as well as those resulting from the caving of large

This article was printed by the bureau of mines as Miners' Circular 17.

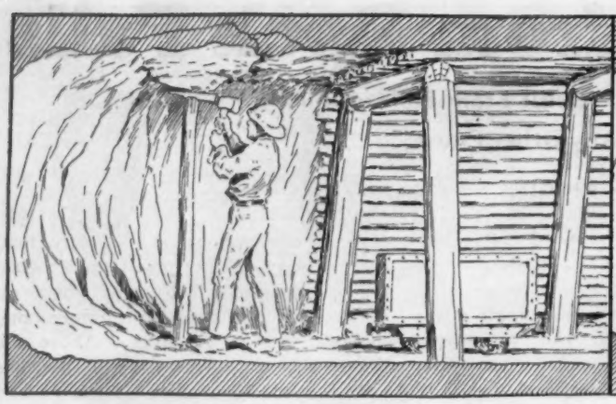


FIG. 3—MINER TRYING TO SUPPORT LOOSE BACK WITH SMALL PROP

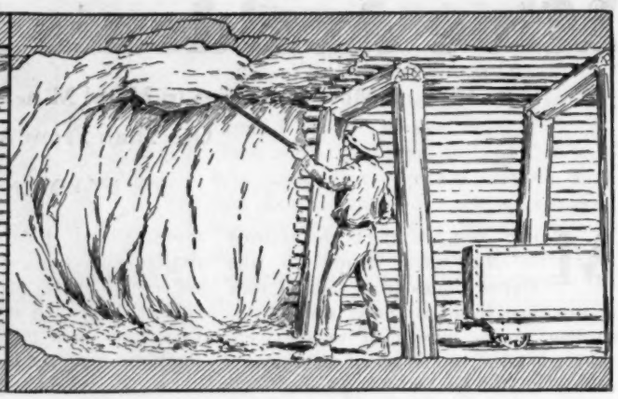


FIG. 4—MINER STANDING UNDER TIMBER GOUGING DOWN LOOSE ROCK

masses of ground. Miners have been killed by being struck on the head by a piece of rock no larger than a baseball. Falls may occur at faces, in timbered or unt'mbered workings, in raises or stopes, in short, at almost any point beneath or beyond the entrance to the mine.

Rock or ore falls because it lacks support. Although hard and firm ground is often self-supporting, there is a limit to the size of the excavation that may be made, even in the hardest ground, without providing support. The usual tendency, whether drifting or stoping, is to use too little timber, or to wait too long before placing the timber.

Drifting Without Timbering

In drifting without the use of timber it is taken for granted that the ground is hard and firm enough to support itself. In this class of work, falls occur when the opening is too large or is not of proper shape. Ground that will not

FIG. 5—TIMBER IMPROPERLY PLACED UNDER A LOOSE BACK—GROUND WITHIN THE DOTTED LINES IS LOOSE

stand if the drift is large may hold well if a small, well-arched opening be carried. If a soft rib of rock is encountered when driving in hard ground, the tendency is to drift through it without timbering; a fall sometimes results. Many accidents are caused by the falling of loose rock. All loose rock should be removed from the face, back, and sides as driving progresses. This should be done immediately on returning to the face after blasting. Fig. 1 shows a mucker who is beginning to load ore at the face without first inspecting the back. Fig. 2 shows the result of such carelessness. The accident might have been avoided had the mucker taken proper care in examining the place before he began work.

In driving in ground where timbering is required many varying conditions are met. In heavy ground, where the rock is soft, mud-sills must be used, for without them the posts (legs) of the timber sets, whether they be large enough or not, will be forced into the floor. If the timber is not large or strong enough the caps and posts will be crushed, provided they can not be forced into the floor. If the timber sets are placed too far apart, the weight of the ground may cause it to break through the lagging. Figs. 5 and 6 show the wrong and right methods of timbering loose ground.

In driving through heavy ground next to a firm hanging wall the danger is from the footwall side, and the cap and the footwall post will take most of the weight. If the footwall is firm and the ledge and hanging wall weak, the pressure will be on the cap and the hanging-wall post. If both walls are hard and the ledge is soft, the greatest weight will be from the back. When the direction from which the greatest pressure is coming is known, timber of sufficient strength should be opposed to this pressure. The sets should be carefully placed and well blocked, and enough lagging should be used. It should be borne in mind always that timber sets or props are not meant to support tons of loose rock or dirt. The usefulness of timber is in taking the weight over a small area, thus relieving a weakness which might soon spread to a large block of ground.

A common cause of falls is the failure to use enough blocking about the timber. Where the ground is at all inclined to fall or slough off there should never be even the smallest space left over the timber sets or lagging. All loose rock should be pulled down and the remaining space filled in solidly with rock or tightly blocked with pieces of timber.

Mining Hard Ore

In mining deposits of hard ore, say 10 to 100 feet or more wide, the usual methods employed are some form of breast, underhand, or back stoping, in which either open stopes or pillars (to be removed later) are left. In back stoping on square sets, large falls may be caused by taking too wide a span. Often men are injured by smaller pieces of ore or rock falling from the back or the sides. In order to avoid these two dangers, rooms, chambers, or stopes should not be carried larger than the nature of the ground will warrant, and

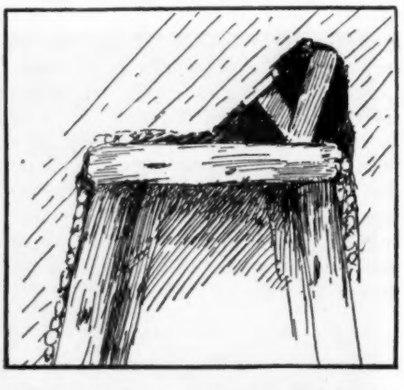


FIG. 6—ONE METHOD OF PROPERLY SUPPORTING A LOOSE BACK—THE ROCK HAS BEEN CLEANED OUT AND SHORT PROPS PUT IN

loose rock and ore should be carefully trimmed from the back and sides. These precautions apply also to breast stoping.

Fig. 3 shows a miner trying to support a loose back with a small prop. This should not be done. Fig. 4 shows the proper method to use. The miner

has inspected the back and found a bad place. He stands under the timber while he gouges down the loose rock.

In underhand stoping, some forms of breast stoping, and other methods in which open stopes are left behind, the miner should remain under cover of the ore being worked, and should keep working places trimmed of loose rock.

Mining in Large Ore Bodies

In large ore bodies, where the ore is of medium hardness or softness, various methods of mining are used, depending on general conditions. In the soft iron ores of the Lake Superior district some form of top slicing or sublevel slicing and caving is employed. In each of these methods, drift sets are used, so that the dangers are much the same as when drifting in heavy ground. Here also it is important to trim loose rock from the working faces and backs. Large falls have been caused by trying to mine soft ore bodies by the room and pillar method.

Of the other methods of mining employed in metal mines, including those used in the various types of ore deposits found in the copper, gold, and other mines of the western states, the most common are different forms of overhead (back) or underhand stoping, in which work is carried on from staging, waste rock, broken ore, or square sets. Where the ore is soft it is usually necessary to work under cover of timber; the dangers to be guarded against are the same as in drifting in heavy ground. Where the ore is hard it may not be necessary to use much timber, but it is often necessary to provide stulls for holding weak walls in place. Slabs or chunks on the hanging wall and loose pieces of ore should be pulled down.

Another important class of ore deposits, as regards accidents from falls, is that made up of irregular shoots, chimneys and pockets. In mining such deposits the method best suited to the conditions is selected. In general it may be said that accidents from falls may be avoided to a great extent by using enough timber. There is always a tendency, especially among prospectors and others working on a small scale, to excavate too large an opening without the protection of timber.

Causes of Accidents

There still remains much to be said as to the causes of accidents from falls, but the illustrations given cover the most important ones. They serve to point out that accidents from falls are due chiefly to the following causes:

First—Mining large areas underground without the use of timber.

Second—Failure to trim or pick down loose rock or ore from working places.

Third—Improper timbering, including the use of too little timber, or the use of timber that is too small or not strong enough; also improper spacing, placing, blocking and lagging.

Fourth—Delay in placing necessary timber.

Any or all of the above causes are directly traceable to *lack of knowledge of the nature of the ground, lack of knowledge of timbering, or carelessness.* Knowledge of the nature of the ground and proper timbering methods are closely related, for if the miner does not know how the ore or rock breaks he can not select a suitable mining method, he can not timber properly, nor can he know when or where to expect a fall.

The following suggestions to the miner should be carefully observed:

Pick down all loose pieces of rock or ore before you start mucking or drilling in a working place.

Stand to one side when pulling or picking down a loose back.

Don't mine too much ore without stopping to consider whether or not timber is needed.

Place your timber properly. If you are not sure it is right, ask the boss or some one else who knows.

Be sure to use enough timber.

If you see a fellow workman doing something dangerous, either through carelessness or ignorance, don't laugh at him; give him advice—and a lift.

See that your timber sets are properly spaced and blocked and that enough lagging is used.

Use "forepoling" or "spalling" in very weak ground; it is slower, but is much safer.

Keep your eyes open for strained or broken timbers. They should be cared for at once by putting in props or new sets. If you are busy with something else, or the job is too big for you, report the matter to the underground boss.

Do not under any circumstances stand under a loose back.

Never take a chance of any kind. If you do, you may be killed; besides you set a bad example for others.

Pull down loose rock; don't attempt to support it on small stulls or props.

When blasting a face try to place and load your holes so that the shots will not dislodge timbers in place.

When in doubt, use timber.

If your place needs support and the timber has not been delivered to you, look up the boss and "kick." Whatever you do, keep out of the place until you get the timber. It is better to lose some of the company's time or your own than to risk your life by working in an unsafe place.

If anything occurs where you are working that you do not understand, such as the movement of a large block of ground, stop work and tell the foreman about it.

Don't sit or stand under broken timbers or bad ground (Fig. 7); find a safe place.

Don't take a short cut through dangerous workings. The longest way around is often the shortest.

FIG. 7—MINERS RESTING UNDER A BROKEN CAP

When the boss tells you that you are doing something dangerous, stop doing it. He is responsible for your safety and knows what he is talking about—that's why he is the boss.

Remember that the management needs your aid in preventing accidents from falls.

Remember that most accidents are caused by neglect of the little things, by disobedience of rules and orders, or by carelessness.

Testing Ground

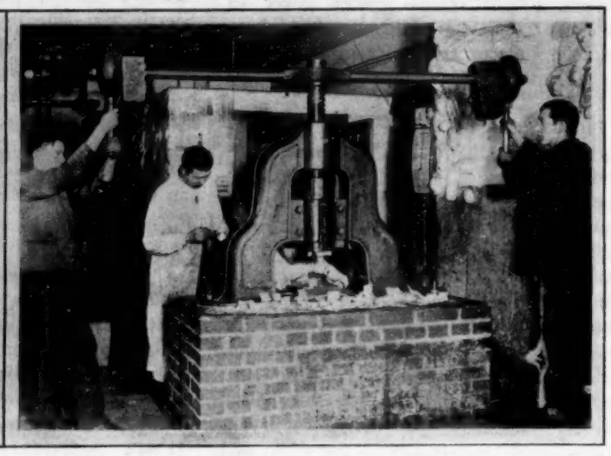
On account of the varied nature of the ground in different kinds of metal mines, no set rule can be laid down for detecting an unsafe place. Ore, or rock, of the same hardness may break in small pieces, or it may come down in large masses. When blasted it may break clean or slabs or chunks may be left

(*Continued on page 398b*)

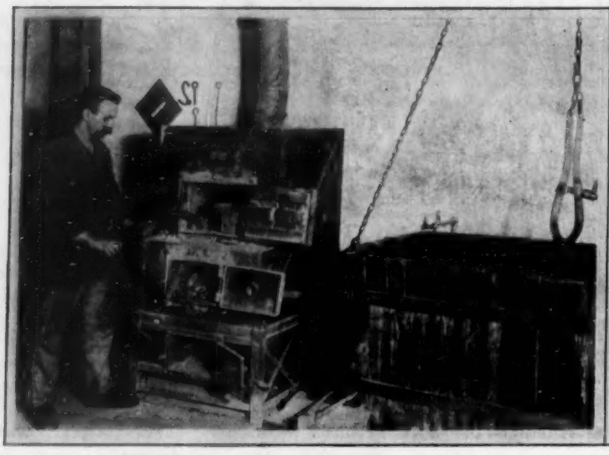
How the Iron Cross is Made

A Series of Interesting, Authentic Illustrations—Captured Cannon Forms Raw Material—Primitive Methods Employed

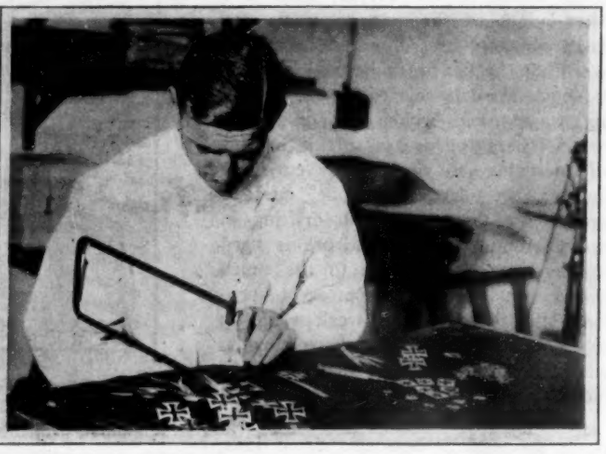
(One)
The blanks for the iron cross are made by melting gun metal in a crucible furnace and pouring it into molds. Many of the 1915 crosses are cast from cannon captured from the armies of the allies in the early part of the war.



(Two)
The cross is cut and formed in a powerful, but antiquated type of hand press operated by boys.



(Three)
After pressing, the cross is annealed in a muffle furnace. Note the quenching tank alongside the furnace.



(Four)
The edges of the cross are bound with silver which is sawed out of the solid.

(Five)
The silver edge is also formed in a small hand press.

(Six)
The date, 1915, is stamped on by hand.

(Seven)
The completed cross is polished on a small, rapidly revolving buffing wheel.

Finishing Temperatures of Rails

Interesting Figures From Tests at South Bethlehem—Good Results From Reheating the Blooms

BY W R SHIMER

FOR THE PAST year or more the Bethlehem Steel Co. has been conducting experiments to learn the effect of finishing temperatures on the physical properties and microstructure of rails and the results are given in this contribution for the consideration of those interested in the rail situation.

Considerable differences of opinion have been expressed by various authorities, in the past, as to the effect of large or small grain size and high or low finishing temperatures of steel rails on their physical properties and wearing qualities. Low finishing temperatures and, therefore, low shrinkage, have been advocated on the theory that the wearing qualities would be improved. Others have recommended high finishing temperatures.

The generally accepted cause for rail failures, due to the development of transverse fissures, is excessive wheel pressure on hard rails. One of the causes advanced for hard rails has been that they contain too high percentages of carbon and manganese; another that the rails were finished at too low a temperature, *i. e.*, at or near the critical point.

In the experiments herein described the rails were rolled from reheated blooms. All the rail blooms were charged hot in a reheating furnace and brought up to about the original ingot-rolling temperature before rolling into rails. These rails gave better results in deflection, withstood a greater number of drops before breaking, and showed greater ductility, than rails of identically the same composition and section which were rolled direct from the ingot. Rails rolled from reheated blooms, finished at somewhat higher temperatures than when rolled direct from the ingot, have a different microstructure, which the writer does not believe is due so much to the difference in finishing temperatures, as to the difference in reduction in one heat. For example, a direct-rolled rail is reduced from the ingot to the rail in one heat, whereas when the blooms are reheated, all the strains set up in the reduction of the ingot to the bloom are relieved during the reheating process.

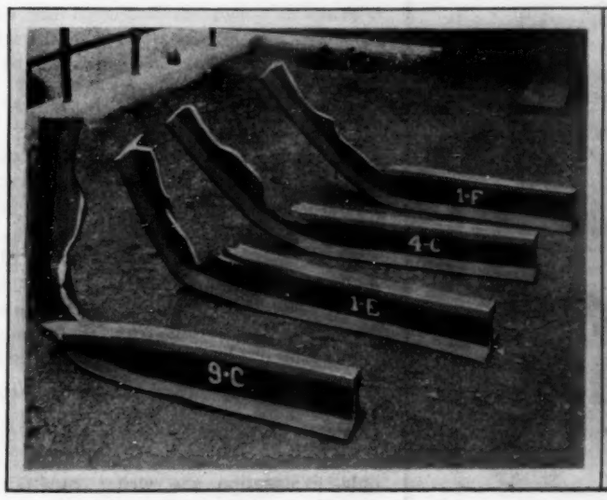


FIG. 1—SOME OF THE RAILS AFTER DROP TESTS

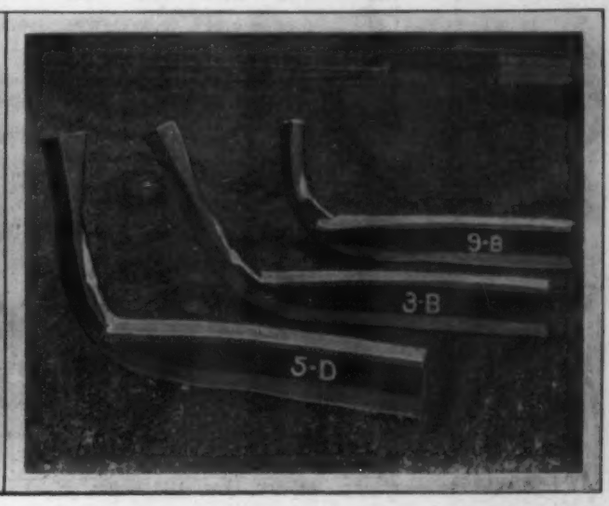


FIG. 2—RAILS SUBJECTED TO DROP TEST

Results of Drop Tests

A few results of drop tests on rails of identical section and of approximately the same composition are given in Table I, comparing rails rolled direct with those rolled from reheated blooms.

The drop-test results of the rails rolled from reheated blooms were superior to those of rails rolled direct from the ingot. Numerous records of direct-rolled rails show the results of drop tests from the same heat to be not uniform with test pieces of uniform chemical composition, taken from the same position in the ingot and free from segregation. Drop tests of rails rolled from reheated blooms show consistently uniform results under the same conditions.

The reason rails rolled direct do not show uniform drop-test results seems to be that, when two or three blooms are rolled from an ingot, rails rolled from the first bloom are finished at the highest temperature, rails rolled from the second bloom are finished at the next highest temperature, while the rails rolled from the last bloom of the ingot are finished at a considerably lower temperature than the first two. If there are any delays at the mill and any blooms are held up they sometimes become too cold to roll, and if they are just hot enough to roll the rails will be finished below the average temperature.

In the case of rails rolled from reheated blooms a uniform temperature can be obtained on all rails rolled. One bloom is drawn from the reheater at a time and sent through the mill. If there is any delay at the mill the blooms remain in the reheater until the mill is ready to roll them. Any desired temperature can be maintained in the reheating furnace so as to obtain the desired finishing temperature on the rails. The temperature of the reheater is regulated according to the composition and section of the rails being rolled.

In Table II results of an investigation on finishing rails at different temperatures are recorded. Nine 19 x 23-inch ingots from the same heat were each rolled into two "three-rail" blooms, each

A paper read at the February, 1915, meeting of the American Institute of Mining Engineers. The author, W. R. Shimer, is connected with the Bethlehem Steel Co., South Bethlehem, Pa.

ingot making two blooms, or six rails 33 feet long of 100-pound section. The composition of this heat was: Carbon, 0.720; manganese, 0.73; phosphorus, 0.019; sulphur, 0.037 per cent. These 18 blooms were charged direct from the bloomer into the reheating furnace and heated up to the original ingot-rolling temperature and, after drawing from the furnace, some were held for different lengths of time, before rolling, so as to obtain a range of high and low finishing temperatures on the rails which were rolled from these blooms. Finishing temperatures were measured on all the rails directly after leaving the finishing rolls. Shrinkages were measured on all the rails. A drop-test piece, 4 feet long, was cut from each *A*, *B*, *C*, *D*, *E* and *F* rail from each of the nine ingots, making a total of 54 drop-test pieces. A short piece, 6 inches long, was cut from each rail directly back from where the drop-test pieces were cut. A standard tensile bar (0.505 inch diameter by 2 inches long) was turned up from both sides of the head of these short rail sections—one from the bottom side of the head of each section as it cooled on the bed, and one from the top side—making 108 tensile bars. Next to the piece for tensile test a thin section was sawed from the head of each of the 54 rails, and used for making Brinell hardness tests. Finishing temperatures ranging from 2,147 to 1,652 degrees Fahr. were obtained in this experiment.

Ingots were numbered from one to nine, inclusive. The positions of the rails in each ingot were as follows: *A* the top rail of the ingot, *B* the second from the top, and so on down, *F* being the bottom rail of the ingot. The *A*, *B* and *C* rails of all ingots were rolled from the upper bloom; the *D*, *E* and *F* rails were rolled from the bottom bloom of the ingots. The shrinkages recorded are averaged from measurements of the three rails rolled from each of the 18 blooms.

The finishing temperatures are fairly consistent with the shrinkages, but there are a few cases where they are not quite so, due to the difficulty experienced by the operator of the optical pyrometer in matching the color correctly. A microscopic examination was made of the threaded end of each of the 108 tensile bars.

All rails were tested head up. Six 1-inch spaces were marked with a center punch on the base of the test piece, and elongations were measured from these punch marks after the rail broke. In some cases the rails bent almost at right angles without breaking in the base; in these cases the elongations are not as great as they would have been had the rail broken in the base. Figs. 1 and 2 show some of the test pieces which bent to almost 90 degrees without breaking in the base, proving them to be exceedingly ductile, although the ductility measurement does not indicate this. The height of drop was 18 feet and the weight of the tup was 2,000 pounds.

The following summary is drawn from a practical standpoint based on the results of the various tests and microscopic examinations and a study of numerous records.

Table I.

COMPARATIVE TESTS OF DIRECT ROLLED AND REHEATED RAILS.

Heat A.—100-pound Rails Rolled Direct.
C, 0.600; Mn, 0.64; Si, 0.068; P, 0.018; S, 0.032.

Ingot No.	No. drops.	Permanent set, inches.	Elongation, 1 in.	2 in.	3 in.	4 in.	5 in.	6 in.	Total.
2	1	1.08	0.05	0.07	0.06	0.05	0.05	0.04	0.32
11	1	1.07	0.05	0.06	0.07	0.05	0.05	0.04	0.32
	2	2.02	0.10	0.11	0.11	0.10	0.09	0.06	0.57
	3	4.06	0.13	0.14	0.15	0.13	0.12	0.12	0.96
	4	Broke.	Not measured.						
19	1	1.07	0.06	0.06	0.06	0.05	0.05	0.03	0.31

Average deflection after the first drop, 1.07 inches.

Heat B.—100-pound Rails Rolled from Reheated Blooms (Compare with Heat A).
C, 0.600; Mn, 0.66; Si, 0.080; P, 0.018; S, 0.034.

Ingot No.	No. drops.	Permanent set, inches.	Elongation, 1 in.	2 in.	3 in.	4 in.	5 in.	6 in.	Total.
3	1	1.60	0.04	0.05	0.05	0.05	0.04	0.03	0.26
	2	2.90	0.08	0.10	0.11	0.11	0.09	0.07	0.56
	3	4.15	0.10	0.13	0.16	0.17	0.15	0.11	0.82
	4	5.40	0.11	0.14	0.17	0.19	0.16	0.12	0.89
	5	Broke.	0.11	0.14	0.18	0.19	0.17	0.14	0.93
2	1	1.60	0.04	0.05	0.05	0.05	0.04	0.03	0.26
1	1	1.40	0.05	0.06	0.07	0.07	0.06	0.03	0.34

Average deflection after the first drop, 1.53 inches.

Heat C.—100-pound Rails Rolled Direct (Compare with Heat D).
C, 0.646; Mn, 0.81; Si, 0.105; P, 0.028; S, 0.029.

Ingot No.	No. drops.	Permanent set, inches.	Elongation, 1 in.	2 in.	3 in.	4 in.	5 in.	6 in.	Total.
2	1	1.30	0.03	0.03	0.05	0.05	0.05	0.03	0.24
	2	2.30	0.04	0.06	0.08	0.09	0.09	0.08	0.44
	3	3.30	0.07	0.09	0.13	0.15	0.14	0.11	0.69
Middle	1	1.20	0.02	0.03	0.04	0.05	0.04	0.04	0.22
	2	2.30	0.06	0.07	0.08	0.09	0.08	0.07	0.45
Last	1	1.20	0.03	0.04	0.05	0.05	0.04	0.03	0.24

Average deflection after the first blow, 1.23 inches.

Heat D.—100-pound Rails Rolled from Reheated Blooms.
C, 0.648; Mn, 0.83; Si, 0.081; P, 0.028; S, 0.031.

Ingot No.	No. drops.	Permanent set, inches.	Elongation, 1 in.	2 in.	3 in.	4 in.	5 in.	6 in.	Total.
1	1	1.45	0.04	0.04	0.06	0.05	0.04	0.03	0.26
	2	2.60	0.06	0.08	0.12	0.09	0.09	0.05	0.49
	3	3.70	0.10	0.13	0.17	0.15	0.12	0.09	0.76
	4	4.70	0.10	0.13	0.17	0.17	0.15	0.11	0.83
	5	Broke.	0.12	0.14	0.18	0.18	0.15	0.11	0.88
2	1	1.45	0.06	0.07	0.07	0.06	0.04	0.03	0.33
3	1	1.50	0.04	0.05	0.06	0.05	0.04	0.03	0.27

Average deflection after the first drop, 1.47 inches.

Summary

No appreciable difference in grain was found to indicate that the size or structure was governed by a difference in finishing temperature.

There was practically no free ferrite in any of the *A* rails, slightly more in the *B* rails, more in the *C* rails, and so on; the *E* and *F* rails from all the nine ingots contained an almost complete network of free ferrite.

The *A*, *B*, *C* and *D* rails all had a more or less sorbitic structure, and the *E* and *F* rails were not sorbitic. The only explanation the writer can offer for this consistent difference between the microstructures of the various rails according to their position in the ingot is as follows:

(1) The absence of free ferrite in *A*, *B* and *C* rails seems to be due partly to the presence of a consistently higher percentage of carbon than in the *D*, *E* and *F* rails.

(2) When these experimental rails were rolled, the rails from each ingot were kept apart on the bed to avoid their being mixed. For example: When Bloom 1*ABC* was rolled, the *A* rail was sawed to length first, and the *C* rail last. When they were put on the bed, the *C* rail was first, the *B* rail next with its base resting against the head of the *C* rail, and the *A* rail last with its base against the head of the *B* rail. These rails were cooling at least 3 to 5 minutes before the *D*, *E* and *F* rails from the bottom bloom of No. 1 ingot came along. When the *D*, *E* and *F* rails went over to the bed, the *F* rail went first, a small space being left between it and the *A*

rail; the base of the *E* rail rested against the head of the *F* rail, and the base of the *D* rail rested against the head of the *E* rail. The head of the *D* rail was left exposed. Therefore, the rails from the various ingots cooled at different rates of speed. The heads of all the *A* rails were air cooled and the structure was sorbitic. The heads of the *B* and *C* rails cooled more slowly on account of having hot rails resting against them, consequently these rails contained more free ferrite than the *A* rails. The *C* rails contained more ferrite than the *B*, and the *B* more than the *A* rails. The head of the *C* rails had an annealing effect longest, the *B* next, and the *A* rail none.

Now, as to the *D*, *E* and *F* rails. The *F* rail was the first to have a hot rail resting against its head, the *E* rail next, while the head of the *D* rail was air cooled. This, it seems to me, shows that this consistent difference in the separation of free ferrite, according to the position of those rails in the ingot, is due simply to the difference in the rate of cooling of the rails.

In order to learn what would happen if samples of *A*, *B*, *C*, *D*, *E* and *F* rails from the same ingot were all annealed at the same temperature and cooled at the same rate of speed, samples from rails 1*A*, 1*B*, 1*C*, 1*D*, 1*E*, 1*F*, 9*A*, 9*B*, 9*C*, 9*D* and 9*E* were charged in the same muffle furnace, heated to slightly above the critical point (1,450 degrees Fahr.), and left to cool slowly in the furnace over night.

After this annealing, the structures of all the rails, except 1*F*, were about the same, and contained no free ferrite. Rail 1*F* contained a network of free ferrite, but as this sample contained only 0.622 per cent carbon and the other 10 samples contained no less than 0.680 per cent, the difference in structure of this sample could be due to its lower carbon content. In the other 10 samples the aggregate of ferrite and pearlite has changed to a homogeneous solid solution. The difference in carbon, together with the difference in the rate of cooling, accounts for the separation of free ferrite in some instances and the non-separation in others.

The above samples were afterward heated to 1,800 degrees Fahr. and allowed to cool slowly in the furnace over night. These samples were polished and etched and micrographs taken of their respective structures. In this case the grain size increased and free ferrite separated out in the boundaries of the pearlite crystals. Approximately the same amount of free ferrite was observed in all the pieces, showing that when heated to a rail-finishing temperature and allowed to cool at the same rate of speed the microstructure is the same throughout, regardless of the position of the rail in the ingot.

The average physical results of the 54 tensile bars tested from all the *A*, *B* and *C* rails are as follows:

Tensile strength.	Elastic limit.	Elongation, per cent.	Contraction, per cent.
125,130	64,150	14.0	19.12

The average physical results of the 54 tensile bars tested from all the *D*, *E* and *F* rails are as follows:

Tensile strength.	Elastic limit.	Elongation, per cent.	Contraction, per cent.
116,300	59,720	16.2	24.54

The average carbon content of the *A*, *B* and *C* rails is 0.711 per cent; of the *D*, *E* and *F* rails, 0.678 per cent.

The *A*, *B* and *C* rails are three points higher in carbon; higher in tensile strength; higher in elastic limit; and lower in elongation and contraction of area than the *D*, *E* and *F* rails. Apparently the slight difference in carbon content has caused the difference in physical properties. Check analyses were made for manganese, silicon, phosphorus and sulphur, and all the results were so close to the original heat analysis that the difference in physical properties cannot be due to these elements.

Table II gives the average carbon contents and average tensile results (each an average of six tests), finishing temperatures and shrinkage of the rails rolled from each bloom.

The table shows that the rails finished at high temperatures have the same strength and ductility as those finished at low temperatures, this conclusion being confirmed by a study of the drop-test results and the micrographs. The latter show that the structure of all the *A* rails is identical; all the *B* rails have the same structure; in short, all rails from the same relative position in the various ingots show the same microstructure. The only difference found, regardless of finishing temperatures, was between the physical properties of the *A*, *B* and *C* rails and the *D*, *E* and *F* rails, which was dependent upon the position of the rails in the ingot. The difference in microstructure was due to the rate of cooling when the rails were on the bed.

The above results refer to rails rolled from reheated blooms. From past experience it has been noticed that the rails rolled direct from the ingot do show differences in physical properties, varying in accordance with their finishing temperatures. The difference, it seems, is due to the fact that when rolling direct from a 19 x 23-inch ingot, or an 18 x 19-inch ingot, considerable strains are set up during this continued reduction, which are increased or decreased according to the finishing temperature.

When rails are rolled from reheated blooms, all the strains set up during the reduction of the ingot to the bloom are removed during the reheating process, since the blooms are reheated to or near the original ingot-rolling temperature. The percentage of reduction from the bloom to the finished rail is not so great as from the ingot to the finished rail, consequently no such strains are set up and therefore a difference in finishing temperature does not seem to affect appreciably the physical properties and microstructure of rails rolled from reheated blooms.

A careful study of the results of the

Table II.

EFFECT OF FINISHING TEMPERATURE ON STRENGTH.

ABC Rails ingot.	Tensile strength.	Elastic limit.	Elongation, per cent.	Contraction, per cent.	Carbon, per cent.	Finishing temperature, deg. Fahr.	Shrinkage, inches.
1	128,000	66,600	14.6	17.91	0.712	2,146	6.60
2	124,330	64,660	12.8	16.90	0.713	2,138	6.69
3	125,910	64,330	13.9	20.20	0.702	2,049	6.64
4	128,000	64,660	14.2	19.04	0.711	2,120	6.77
5	125,660	65,180	11.9	17.39	0.700	2,147	6.64
6	123,660	63,110	14.4	20.56	0.700	2,012	6.37
7	124,500	63,350	14.1	19.84	0.706	1,868	0.06
8	124,500	63,330	16.0	20.30	0.733	1,850	5.85
9	121,600	61,800	14.1	19.98	0.714	1,832	5.66
Average..	125,130	64,150	14.0	19.12	0.711		
DEF Rails, Ingot.							
1	118,750	60,500	15.6	24.71	0.669	2,020	6.44
2	116,580	59,660	16.5	23.90	0.664	2,084	6.63
3	116,830	60,670	15.9	23.07	0.667	2,120	6.71
4	116,100	59,500	15.7	22.41	0.650	2,147	6.65
5	116,000	59,500	16.1	24.09	0.676	2,048	6.56
6	116,100	60,400	15.7	22.07	0.665	1,904	6.37
7	115,660	59,500	16.6	25.81	0.674	1,850	5.81
8	115,400	59,250	16.9	24.83	0.681	1,841	5.69
9	115,330	58,910	17.0	30.00	0.680	1,652	5.37
Average..	116,300	59,720	16.2	24.54	0.678		

drop tests recorded in this report shows that the rails finished at high temperatures are equally as good as those finished at the lower temperatures. Figs. 1 and 2 show drop-test pieces representing the following rails:

1-E—Finished at 2,020 degrees Fahr.; shrinkage 6.44 inches; stood six drops and did not break in the base.

1-F—Finished at 2,020 degrees Fahr.; shrinkage 6.44 inches; stood six drops and did not break in the base.

3-B—Finished at 2,048 degrees Fahr.; shrinkage 6.64 inches; stood five drops and did not break in the base.

4-C—Finished at 2,120 degrees Fahr.; shrinkage 6.77 inches; stood five drops and did not break in the base.

5-D—Finished at 2,048 degrees Fahr.; shrinkage 6.55 inches; stood five drops and did not break in the base.

9-B—Finished at 1,832 degrees Fahr.; shrinkage 5.66 inches; stood six drops and did not break in the base.

In addition to those shown in the photographs, 9-D and 9-E finished at 1,652 degrees Fahr; shrinkage 5.37 inches; stood six drops and five drops respectively and broke in the same manner as those illustrated. The following drop-test pieces also broke in the manner above described: 1-*A*, 1-*D*, 1-*E*, 1-*F*, 2-*A*, 3-*A*, 3-*B*, 3-*C*, 3-*D*, 4-*C*, 4-*D*, 4-*E*, 5-*A*, 6-*A*, 6-*B*, 6-*C*, 7-*D*, 9-*B*, 9-*D* and 9-*E*. These drop-test pieces represent a wide range of finishing temperatures, shrinkage and microstructure, but have almost identical physical characteristics as shown by the results of this test, which is the important test of the quality of a rail.

The conclusions above are based on the results of a carefully carried out investigation along practical lines. The primary object of these experiments was to determine the best finishing temperature for steel rails. There was a variation of 500 degrees Fahr. in the finishing temperatures and a variation of 1.34 inches in shrinkage. Even with this wide range in temperature and shrinkage, it was impossible to determine, from the results of the respective tests, at what temperature a rail should be finished in order to obtain the best results, since all the tensile and drop-test results recorded are good, and practically identical. The results show it is equally impossible to decide what microstructure and shrinkage are desirable.

Further, from the results of this investigation we have learned that rails rolled from reheated blooms are more ductile than those rolled direct from the ingot, regardless of their finishing temperature. Also, we have learned to be cautious with regard to judging from the microstructure as to the temperature at which a rail was finished and to be careful in drawing conclusions from the microstructure, alone, in rail-failure investigations. The microstructure appears to be controlled more by the rate of cooling from above the critical point than it does by the temperature at which it was finished. In regular practice rails cool uniformly, since hot rails are going to the bed continually, and therefore the microstructures do not vary as much as they have in this experiment. Further investigations on this subject are being conducted and the results may be published at some future date.

Coke Recovered from the Cupola Dump

BY W J KEEP

IT IS common practice among foundrymen to take the half-burned coke from the cupola drop and to let the man on the charging platform use it as he pleases without weighing. As it is water-soaked the weight would not be correct and as it has been weighed once, it should not again be charged against the cupola fuel consumption. It is desirable, of course, to charge no more iron and coke than is necessary to make the last iron good. At best, considerable iron will remain unmelted or will be cast in the pig bed. A corresponding amount of coke will be left over, but much of this fuel is burned by the sharp blast and hot cupola at the end of the heat. The best practice is to decrease the coke on the last three charges and frequently the last charge of iron can be melted without the addition of coke, the heat in the cupola walls being sufficient to melt the iron. The coke left over is not considered of much value and it certainly does not appear to have much fuel value.

In the production of a certain grade of iron, it was found desirable to have the sulphur run as low as possible and the cars of coke containing exceptionally low sulphur were saved for that purpose. When we previously used Connellsville coke it was considered desirable to have the ash content about 10 per cent so that the coke would satisfactorily carry the weight of the burden. Rarely was the sulphur less than 0.75 per cent and frequently it was 1 per cent or more. The by-product coke which we are now using has a firm structure and a low percentage of ash. One morning it occurred to me that the burned coke should be high in ash and low in sulphur and if so, it should be charged on the bed. I took samples of by-product coke from the car from which the half-burned coke was taken and sent it to the producer to obtain the opinion of his chemist and to ascertain the analyses of both the burned and the unburned coke.

He reported that the partially-burned coke is higher in ash than the average coke and for that reason would not be quite so good for melting iron. On the other hand, it is lower in sulphur than the unburned coke and for this reason it would be more desirable for melting iron than fresh coke. Apparently the sulphur is imparted to the iron in a gaseous state and not from the molten or slag state. If the burning coke is not disturbed, the coke holds its original shape fairly well, retaining the ash as the carbon burns out, but in a cupola, the chemist ventured the opinion that the burden and the movement downward would have a tendency to separate the ash somewhat from the coke during burning. The report of the chemist follows: A sample of coke was obtained from the ovens containing 7.40 per cent ash and 0.902 per cent sulphur. Several pieces of this coke, about nutmeg size, were weighed, placed in a platinum dish and heated in a muffle about 1½ hours. Nearly two-thirds by weight of the coke was consumed, the volume remaining nearly the same and very little of the ash fell off while the coke burned, if it remained undisturbed. The unburned portion of the partly burned coke contained 8.86 per cent ash and 0.706 per cent sulphur. The ash from the burned coke contained 0.152 per cent. The weight of the pieces taken was 20.4419 grams, the amount burned off was 13.2741 grams and the unburned coke left weighed 7.1673 grams. The ash balance follows:

Grams of ash in coke at start..		1.5127
Grams of ash in unburned coke	0.6351	
Grams of ash actually burned part.	0.8764	1.5115
Unaccounted for		0.0012

The sulphur balance was:

Grams sulphur in coke at start..		0.1844
Grams sulphur in unburned coke	0.0506	
Grams sulphur in ash.....	0.0013	0.0519
Grams sulphur gone off in gas (by diff.)		0.1325

0.1338 gram (0.1844—0.0506) of sulphur left the coke.

Of this 99.03 per cent went off in gas, while only 0.97 per cent remained in the ash.

Another sample of coke was obtained containing ash, 6.96 per cent,

(*Continued on page* 398b.)

A paper read at the Chicago meeting of American Foundrymen's Association.

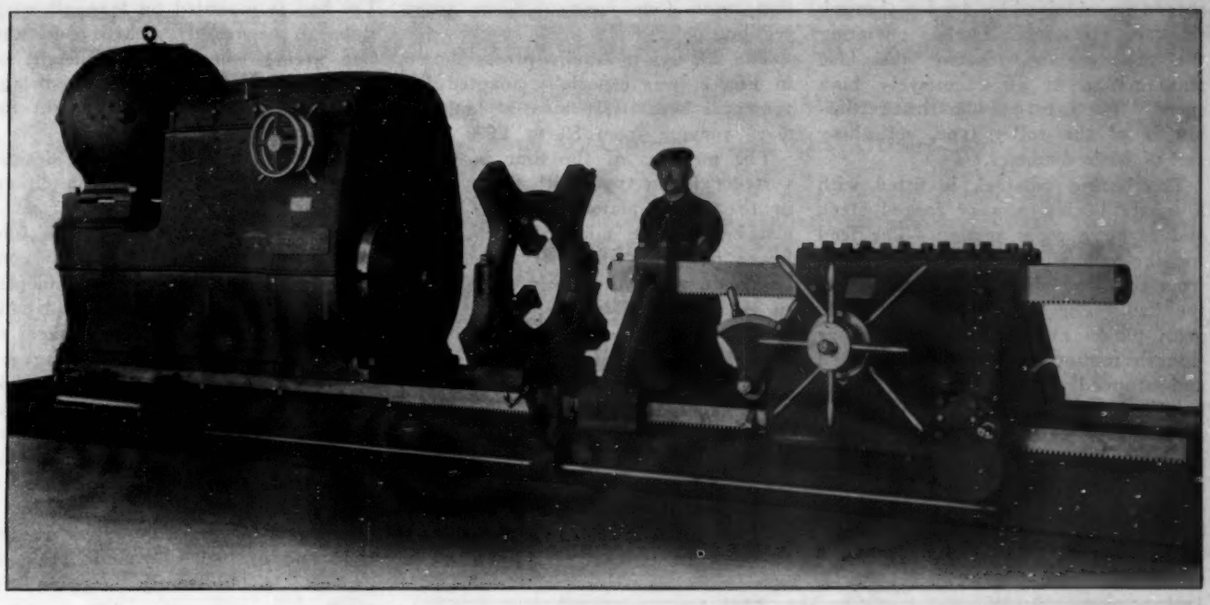


Fig. 1—Heavy Projectile Boring Lathe

Machines for Making Projectiles

Descriptions of New Heavy Duty Lathes and Hydraulic Press Developed by the Niles-Bement-Pond Co.

DEVELOPMENT of American machine tools for the manufacture of guns, projectiles, small arms and other war munitions has received added impetus since the outbreak of the European war. American machine tool manufacturers in the past few months have developed their machines to a high degree of efficiency. The interest now being shown in this class of tools probably is greater, than at any previous time. The accompanying illustrations and descriptions cover three new machines recently brought out by the Niles-Bement-Pond Co., New York, which are especially designed for operating on this class of work.

Projectile Boring Lathe

In Fig. 1 is shown an unusually powerful lathe for rough and finish boring of projectiles from 6 to 14 inches in diameter. The driving and feed gears and feed rack are forged or cast steel. The main and high speed bearings are bushed with high grade bronze.

The bed has flat tracks and is of large cross section, with box girder cross ties at frequent intervals. A rack is cast in the center between the tracks for the tail brace pawl. The headstock is of massive box construction. It is unusually long, 7 feet 5 inches on the bed, furnishing a rigid support for the spindle, gearing and motor. An idea of the large proportions of the head can be gained from the size of the front spindle bearing which is 8 inches in diameter and 23 feet long.

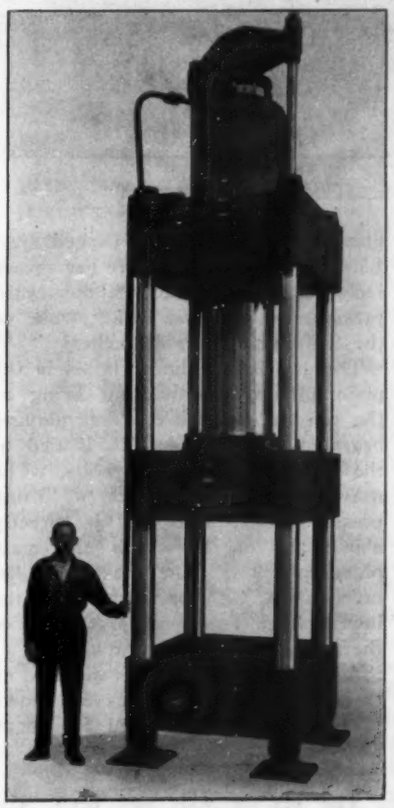


FIG. 2—HYDRAULIC PROJECTILE PRESS

All of the bearings and gears are entirely enclosed, and oiled continuously from a tank in the head which is kept filled by a pump drawing oil from a tank in the bed. The main spindle is driven by a 35-horsepower direct-connected, variable speed motor mounted on the headstock, through gearing which gives three mechanical changes of speed controlled by convenient handwheels. The gearing in conjunction with the speed variation of the motor by the controller, gives about 60 face plate speeds varying from 2½ to 77 revolutions per minute. By means of a handle, adjustably mounted on the bed, the face plate may be started, stopped, reversed, or any of the different motor speeds obtained, without requiring the operator to leave his position at the boring tool.

Speed Changes

The low speeds of the face plate are obtained by a pinion driving the face plate gear and so mounted in the headstock as to eliminate any tendency to lift the main spindle in its bearings and also relieving the main spindle caps of the upward thrust due to the cut. The higher

speeds are obtained by driving through the face plate spindle, thus obviating the necessity of running the face plate pinion at an excessively high speed. The main spindle thrust bearing is of the roller type, self-oiling and of large diameter.

The boring tailstock is fitted with a square boring ram of forged steel, and of large cross section. The feed for the ram is from a shaft running from the head along the back side of the bed. The feed is through rack, gear, pinion and worm gear to give smooth motion. The feed is started and stopped and reversed by large hand spiders.

Eight feeds are provided, varying from 0.005 to 0.030 inches per revolution of the face plate. Four of these feeds are obtained by a positive clutch mechanism without change of gears, the changes being made by two levers on the front side of the tailstock, and traveling with it. The remaining four feeds are obtained by one change of gears at the head end. The boring bar has a continuous feed of not less than 48 inches without resetting of the tailstock.

The tailstock is long and of large cross section, affording rigid support for the boring ram. The tailstock can be securely fastened in any position on the bed by large bolts and heavy clamps. In addition the tailstock is fitted with a tail brace engaging the rack in the bed which prevents slipping under heavy end thrusts.

A support which slides with it on the bed, is provided for the boring ram. This supports the ram near the end carrying the tools and tends to prevent vibration. The steady rest is designed to take from 6 to 20 inches in diameter. It is of stiff box section, with four jaws of large cross section.

The 225-ton hydraulic press, shown in Fig. 2, was especially adapted for projectile work. It also is built in sizes varying from 50 to 1,000 tons.

The press is of the four post, inverted cylinder type, with the cylinder in the upper platen and the piston attached to the middle platen. The lower platen is stationary, the work being done by the downward stroke of the middle platen.

The platens are of heavy box section, 54 inches square. The tension bolts which form a guide for the movable platen are of forged steel, 5½ inches in diameter, with 37 inches by 37 inches clear distance between the bolts.

The main cylinder is supported by the upper platen and is a separate casting. Its plunger is 21⅝ inches in diameter and is hemp packed. At 1,500 pounds water pressure per square inch, the plunger exerts a downward pressure of 275 tons. The stroke of the main plunger is 36 inches.

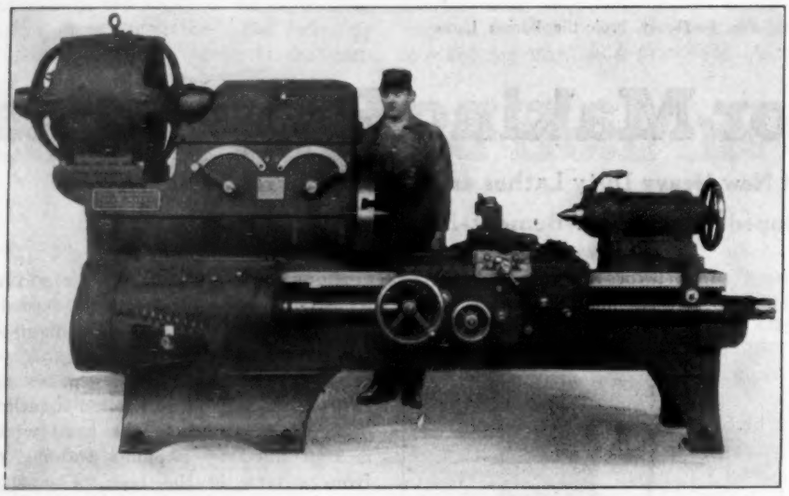


FIG. 3—HEAVY DUTY PROJECTILE TURNING LATHE

The drawback cylinder is set in the main plunger, its packing being at the top and accessible. This plunger bears upon a yoke, which is tied to the movable platen by bolts. The drawback plunger exerts a lifting pressure of 50 tons and is directly above and in line with the main plunger center. The maximum distance from the top surface of the lower platen to the under surface of the working platen is 76 inches.

A lathe for turning projectiles up to about 8 or 10 inches is shown in Fig. 3. It is designed for rough and finish turning and is built in 20-inch and 24-inch sizes.

The bed is wide and deep, with box girder cross ties and flat tracks. The bed is mounted on legs, allowing chips to be readily cleared out, and also giving spindle center height of 42 inches above floor, which brings the work at a convenient height for the operator.

The headstock is of heavy design. The face plate is driven by a direct-connected 15-horsepower motor of 2 to 1 speed variation. There are four mechanical changes of speed controlled by two levers conveniently located on front of the headstock. The speed levers are interlocked so that two speeds cannot be engaged at the same time. The gearing in conjunction with the speeds changes by the controller, give 60 face plate speeds, varying from 12 to 350 revolutions per minute. The motor is started, stopped and reversed by a drum type switch, mounted at the head end of bed. Dynamic brake is provided for instantly stopping the work.

The face plate is removable permitting the rapid interchange of face plate and chuck. All bearings in the headstock are bronze lined. All the bearings and gears in headstock are entirely enclosed and oiled continuously from a tank in the head, which is kept filled by a geared pump drawing oil from a tank under the head, into which all surplus oil drains and is filtered before being used again.

The carriage is fitted with flat tracks bearing the entire width, making a very short span for the bridge of carriage. The carriage is gibbed to the bed underneath the tracks both front and back. The tool rest is of the compound swiveling type, travels in a wide bridge and is of such length that the bearing surface is not uncovered when turning largest diameters. The tool has both hand and power longitudinal and cross feed in either direction. The upper slide has a swiveling tool holder open on one side and of ample strength for holding tools 1¼ x ⅞ inches.

The apron is of substantial, ribbed box construction, supporting the feed gear shafts at each end. The friction for engaging the power feed is of large diameter. A wide range of feeds is provided, the changes being made by a quick-change gear mechanism operated by one handle.

The tailstock is of very large box section, which is considerably increased toward the end carrying the center. The tailstock can be securely fastened in any position on the bed, by means of four large bolts, running to the top, and heavy clamps. In addition to this a tail brace, engaging a rack in the bed, is provided

(*Continued on page* 398c.)

"Details of a National Disgrace"

Do You Support the Policy of the Government Buying Materials From Foreigners While American Shops Are Closed?—Read What Others Say

STRONG condemnation of governmental methods of receiving bids and awarding contracts is voiced in the numerous comments received by THE IRON TRADE REVIEW on the article published in the Feb. 4 issue, under the heading "Details of a National Disgrace". Letters were received from many of the leading manufacturers of the country and a number of interesting side lights upon the methods followed at Washington in letting contracts, are brought out.

The following excerpt from a letter received from a prominent Ohio builder of cranes, typifies the spirit in which large American manufacturers are forced to regard government work: "We assure you that the case as outlined in the article mentioned is not the least bit too strong. It is simply marvelous that the American manufacturers stand for the treatment they receive from the officials of the government, the people who they make and give authority to handle affairs for them. Broadly speaking, the policy pursued at Washington is such that we believe the government gets the worst end of it when they do make purchases, and there is no question but what it is preferable for the manufacturers to work with the commercial world than it is with the government. We make very few propositions to the government of late years, and unless conditions change, they will be fewer in the future."

The article under discussion was in reference to the purchase by the Panama canal commission of two gigantic floating cranes for service at the Panama canal. These cranes were the largest of their kind ever built and the bids were widely advertised. Despite this fact, only three formal proposals were received, one each from America, England and Germany. This fact alone indicates that either the specifications were unusually rigid, or that there were other circumstances connected with the transaction which prevented other responsible firms from bidding. The almost universal sentiment expressed in the letters which were received, would indicate that these "other circumstances" can be traced directly to the methods followed at Washington in purchasing governmental supplies.

The American bid for the two cranes was $1,450,000; the English bid, $1,118,000; and the German bid only $821,300. A number of stipulations in the original specifications which had been considered of sufficient importance to be printed in italics, were disregarded by the German firm, thereby saving itself considerable expense, to which the American firm was subjected. These "important" restrictions were waived aside and the contract given to the firm of German builders.

The American design called for a machine weighing 8,300,000 pounds. The German crane weighed 5,960,000 pounds. Despite the wide difference in the bids submitted, the price per pound was practically the same. In testing, the first of these two cranes collapsed under slightly less than maximum load. The cranes were to be in service in August, 1914, but the second has not been tested, while it will require from four to six months to put the defective crane in working condition. The damage is estimated all the way from $120,000 to $150,000.

Another prominent Ohio builder of cranes writes to THE IRON TRADE REVIEW as follows:

"You certainly are to be complimented for the very snappy and truthful article in your Feb. 4 issue, giving the 'Details of a National Disgrace'. It would indeed be fine if every congressman and senator could be favored with a marked copy of this publication. This is something that is really a national topic as much as an engineering one, and for the benefit of the manufacturing trade generally of engineering lines similar to our own. It would be worth consideration to have a marked copy of this publication in the hands of every senator and congressman, as it is certainly a fine article."

A Michigan builder of cranes sheds light upon the manner in which the government has been accustomed to purchase its material:

"One of the most interesting phases of the question is that of favoritism and the extremes to which some of the departments go, in order to secure the adoption of a certain type of machinery for which some mechanical man at the plant may have a preference. This sometimes takes one form and sometimes another. One of the cleverest schemes is to embody in the government specifications, an exact description of the machine wanted, without stating the name of the maker, but even specifying the sizes of the principal parts. To be sure, we are generally told that they will consider a substitute machine, but we venture to say that there is little consideration given to it, when the time comes.

"Another method is to describe a machine briefly and broadly and then refer to certain data which must be obtained from the navy yard concerned. The original advertisements are sent out in what they consider ample time for all bidders to compile prices, but when the bidder reads over the specifications, he invariably finds it necessary to send for further specifications. These often come in in dribbles. A short time ago, we received a final 'driblet' just the day before the final letting in Washington. We were, of course, barred from bidding and the firm whose specifications were embodied in the original specifications doubtless received this contract.

"We may state that we have filed protests against this method of letting contracts and we are frank to say that the paymaster general of the navy has certainly shown a disposition to do what was right and in a letter recently received from him, he says that our letter of protest 'was the most courteous and respectful protest which I have ever received against a condition which appears to the writer as objectionable as the conditions must have appeared to you in this case.' This shows that there is a disposition to do what is right but we presume that the ability to carry out the right plan is tangled up in a mass of red tape and withal, we do not believe there is any dishonesty about it. As stated above, we think it is simply purchasing incompetence and lack of business sense."

William H. Ridgway, vice president of the Craig Ridgway & Son Co., Coatesville, Pa., submitted the following interesting letter:

"We have your esteemed favor of the 6th inst. and we will say in reply that we were very much interested, indeed, in your article covering the collapse of the 250-ton German floating crane, purchased by the canal commission. However, we were not surprised, and we do not see why anybody should be surprised.

"It has generally been the policy of our government to buy the cheap-

est thing that is offered to them. We have been asked ourselves to bid on work for the government, and we have refused to take the trouble to do so, because we knew we would have our labor for our pains. In fact, we have written the various departments who have asked for prices, from time to time, calling attention to what we considered a mistaken policy.

"We contend that it is the duty of the government, with an unlimited pocketbook, to buy the very best of everything that can be bought, with the price a secondary consideration. Everything about the government should be of the very highest character, and the best engine, the best crane, as well as the best suit of clothes, is never the cheapest thing in the line.

"For some reason, however, the red tape at Washington, or something else, requires usually the selection of the cheapest thing, and in the language of the shop, the 'nastiest'. Indeed, we do not have to remind you of this because you know, and everybody knows, that when the government is mentioned, manufacturers of machinery just look at each other and laugh, and this feeling is expressed in the following song, which you often hear men sing, especially in these times:

" 'Soup for Saturday, soup for Saturday,
Times are mighty hard.
Working away for a dollar a day,
Down at the navy yard.'

"Of course, nobody works for a dollar a day down at the navy yard, but the song has in it the sneer at the 'Cheap John' policies pursued by the departments in the purchasing of equipment.

"In late years there has been cultivated by certain persons, wherever they could do so, the idea that every manufacturer is a rascal and a thief. I have no doubt that when the American builder's price was handed in asking almost double for the machine what the German people asked, there were those who called that American builder a robber, yet according to your article he was figuring at about the same price per pound, as the manufacturer across the water. The difference in the American manufacturer and foreign manufacturer was that the former expected to put the material into the machine, in the old American fashion, while the foreigner expected to build the crane like the German cutlery we buy at the hardware stores, which seems to be made simply to display in the cases, and to sell to the fellow from Squeedunk, who doesn't know any better.

"Any man who buys the cheapest machine that is offered to him is a fool, because when you get the best there is, nobody gets anything any too good, and the dictionary fails to supply terms to characterize the policy that compels the United States government to buy the lowest priced stuff that is offered to them. In the present instance Uncle Sam has found out, what the rest of us continually find out, that in this world you get just what you pay for, and no more.

Yours with regards
'Old Hook'er to the Biler.' "

Of the many comments received, only two support the government in its position of awarding contracts to foreign firms at a time when thousands of American working men were being laid off because of the depressed conditions among domestic manufacturers. One eastern firm after frankly admitting that it did not deem it "wise to oppose the general principle of our government purchasing abroad, if for no other reason than we have for years and are continuing to furnish foreign governments with our machinery" states that such purchases should be made only when the reasons are unanswerable and after the "fullest possible opportunity has been afforded to home builders".

But one letter was received which condemned THE IRON TRADE REVIEW for favoring American-made goods for America. This letter in full is as follows:

"Please permit me to voice a word of protest against your article on page 275 of the Feb. 4 issue, with reference to the crane that failed to make good at Panama.

"You make the failure of this crane the basis for a virulent attack on the U. S. government department in charge of the work. Nothing could be more unjust or illogical.

"You feature the fact that this contract was awarded to a German firm 'while thousands of American artisans tramped the streets hunting for work'. Of course you know just as well as the writer does, that the thousands of American men would still have been hunting work even if the contract had been awarded to an American firm, for $600,000 more.

"On both price and delivery there was no question of the superiority of the German bid, and the department was asked to pay $600,000, I take it, on a very questionable little item of some inches in reach—an item which, by the way, was not deemed vital evidently by the men who awarded the contract.

"The pith of your attack is that the order was given to a foreign firm.

"Evidently the editor of THE REVIEW believes in that old absurdity that 'if you buy your goods abroad you get the goods but they get the money, and if you buy them at home you have the goods and the money too.'

"Nothing could be falser than that threadbare and unreasoning fable.

"First, cash is not wealth. Cash does not even represent wealth. It is the channel through which wealth may go. The country that has the most cash in the world is not necessarily by any manner of means the richest country. Wealth is represented by land, by houses, by resources, by machinery, by food products—by anything that is of value to the world.

"Second, the same article has different values in different parts of the world, and different values to different people. A huge chunk of fat is worth many dollars to the polar explorer, and a few cents to the man on the equator. A fine mowing machine is not worth much to the opera singer.

"Third, let us say that a certain machine (a) has a value in this country of $1,000. Let us say its value in Europe is $600. Now, if we wish to purchase the machine (a) and buy it in THIS country, the wealth of this country remains the same, no cash or property passing in or out. But, if we purchase the machine in Europe at $600, then the wealth of the nation has been increased by $1,000—$600 or $400 on the transaction. Do you see it?

"You know, the governments of Europe used to have laws that cash couldn't be taken out of the kingdom. But that barbarous and benighted day has long since passed away.

"It is, of course, unfortunate that the crane failed to give satisfaction, but it is absurd to blame the governmental department, who did just what should have been done."

The "old absurdity" referred to in the above communication was advanced by no less an authority than Abraham Lincoln, so that the editor of THE IRON TRADE REVIEW in retaining this viewpoint may be mistaken, but has distinguished company. The theoretical argument advanced in the closing paragraphs of this letter, if carried to its ultimate conclusion, would make this country so wealthy that it would be unable to pay its grocery bill, as the European manufacturer

would have all of our quick assets.

One manufacturer believes that present-day laws are so framed that American companies are practically precluded from bidding upon government work.

This manufacturer, also a prominent Ohio crane builder, writes in part as follows:

"In our opinion, the government directly precludes the purchase of such an equipment from manufacturers who are not under the jurisdiction of the laws of the United States.

"All government specifications specially provide for strict compliance with the labor laws, particularly as regards the number of hours out of 24 during which men may be employed on work being executed under government contracts. This, therefore, being a provision of the contract, and inasmuch as this authority cannot be exercised over a corporation which is outside of the jurisdiction of the United States, it seems that there would be but one logical conclusion possible. Any department of this government which attempts to dictate the conditions which must govern in the execution of the contract and which, therefore, bind the prospective bidder to certain conditions, should not admit any bid as formal which does not comply with such conditions and by not doing so, puts the bidder in the former case at a disadvantage which it is not possible for him to overcome.

"If for any reason, the government does not choose to regard the matter in this light, it seems to me that the specifications could be directly construed as favoring manufacturers who are not under the jurisdiction of the laws of the United States."

A large central Ohio manufacturer after stating his belief that the Panama canal should be American throughout, suggests the following label for the collapsed crane: "Made in Germany and Rebuilt by the United States."

Big Flooring Contract.—The Ayer & Lord Tie Co., Chicago, has just made a contract with the Homestead Co., Des Moines, Ia., to equip its new seven-story publishing plant with 10,000 yards of creosoted wood block. This building is of fireproof construction and Ayer & Lord flooring was decided upon after careful consideration.

Extends Machine Shop.—The contracts have been awarded for an extension, 100 x 95 feet, to the machine shop of the Landis Machine Co., Waynesboro, Pa., manufacturer of grinders and other tools. The building will be of steel construction type and the Belmont Iron Works has received the contract for the fabrication and erection of the steel work.

Traffic Club Dinner

E. B. Mitchell, of the Pennsylvania railroad, chairman of the annual dinner committee of the Traffic club, of Pittsburgh, has announced Friday, March 5, as the date of the thirteenth annual banquet of the organization. Speakers will be: W. L. Clause, president of the Pittsburgh Plate Glass Co., who will speak on the "Federal Trade Commission"; and Hon. John W. Weeks, senator from Massachusetts, who will speak on "The Relation of the Government to Business". George A. Blair, of the Chicago, Milwaukee & St. Paul railroad, will act as toastmaster, and E. F. Walk, president of the association, will preside. The event will be held at Memorial hall, Pittsburgh.

New Refractories Plant

The new plant of the Danville Refractories Co., at Danville, Ill., is expected to be in operation between May 1 and June 1. It will start with an initial capacity of 50,000 9-inch silica brick. The designed capacity is 150,000 daily. Cassius C. Chany, now superintendent of the American Refractories Co., Joliet, Ill., will become works-manager of the Danville plant on April 5.

William A. Miller, formerly with the Harbison-Walker Refractories Co., at Hay's station works, and late with the Alabama works, and more recently with the American Refractories Co., will be superintendent of the new plant. Chester W. Desing, in charge of the pattern department of the American Refractories Co., will be master mechanic.

The plant will make a line of silica brick and shapes, also magnesite and chrome products. It has a capital of $300,000. Edward Heley is president, and C. J. Crawford, both of St. Louis, is vice president, treasurer and in charge of the plant.

Eastern Branch.—A special meeting of the National Scrap Iron and Steel Association was held in Chicago recently, when a movement was started for the formation of an eastern branch, including New York, Philadelphia and adjacent territory. The national association recently was formed by a union of associations centering about Chicago and about the Pittsburgh-Cleveland district.

Expense of Accidents

A bulletin is being distributed by the National Safety Council of Chicago bearing on the results obtained by the safety department of the Commonwealth Steel Co., Granite City, Ill. This shows that from July to December, 1912, when the safety campaign was being inaugurated, the expense of accidents in compensation payments was 2.08 per cent of the payroll. Since that time the succeeding six month periods have shown 1.03 per cent, 0.98 per cent, 0.29 per cent and 0.85 per cent.

The Commonwealth Fellowship Club, which is a feature of this plant, started in January, 1915, the publication of a safety first magazine called *The Commonwealther*, which will be issued monthly and will be devoted to safety first discussions and other matters of interest and value to employes.

Taking on Men

The Standard Welding Co., of Cleveland, has added 79 men to the working force in its automobile rim department. Officials of the Welding company report that automobile manufacturers are ordering up to specifications. The added working force will bring to more than normal the production of rims by the big company.

To Move General Offices. — Last week the general offices of the Asbestos Protected Metal Co., including the executive, accounting, sales and engineering staffs, were moved from the Beaver Falls plant to the First National Bank building, Pittsburgh. The manufacturing operations of the company will continue as heretofore, at Beaver Falls, Pa., and at Waltham, Mass.

Will Blow Out.—The Lake Superior Iron & Chemical Co. has decided to close its furnace at Elk Rapids, Mich., and to continue active only those at Boyne City and Newberry. The company has been considering resumption of operations at the Manistique and Ashland plants early this year, but conditions do not warrant blowing in either stack.

The Blood Bros. Machine Co. has completed the removal of its factory and offices from Kalamazoo to Allegan, Mich. This move was made in connection with the company entering the field of light car manufacture with its Cornelian light car, in addition to making universal joints and other automobile parts in which it has been engaged for the past 11 years.

Money and Iron: Fact, Comment

Republic Iron & Steel Co. Makes Poor Showing

But Improved Methods of Operation Had Good Effect—Stocks Make Gains Influenced by United States Steel Corporation's Increase in Unfilled Tonnage

DECIDEDLY the worst in the history of the company as to prices and demand, but with earnings considerably above previous periods of depression on account of lower costs as the result of improved facilities and other economic influences, with wages of employes not reduced. Such is the description of the past year by Chairman John A. Topping in the report of the Republic Iron & Steel Co. for the fiscal year ended Dec. 31, 1914. The net earnings applicable to dividends on the $25,000,000 preferred shares were $1,028,748, equivalent to 4.12 per cent, as compared with $3,101,300, or 12.4 per cent for the year 1913. Earnings for dividends the first six months were equivalent to 2.47 per cent, while for the last half only 1.65 per cent was applicable to dividends. In view of this report, it is not surprising that the directors last December decided to pass the dividend on the preferred stock.

The net earnings applicable to dividends, $1,028,748.15, were realized from production and shipments that represented a tonnage of approximately 66-2/3 per cent of capacity, which, as compared with the previous year, indicates a loss in tonnage of 25 per cent, and a shrinkage in value of 33-1/3 per cent.

Commenting upon the unsatisfactory condition of the iron and steel business and the contributing causes of this condition, reference is made to the last report the company issued, last July. At that time Chairman Topping said:

"The earnings of the company for the six months' period ended June 30, 1914, emphasize the general effect on business resulting from tariff reductions and trade hesitation, incident to the enactment of new laws and the discussion of radical legislation."

The annual report says that these same unsatisfactory conditions continued throughout the entire year, although there was some recovery during July and August. But immediately following the declaration of war abroad, general business (except that relating to munitions of war, which supplies the company states it does not produce) again was upset. Both markets and finance became so generally demoralized and the future course of business so uncertain that the board of directors authorized for issue a circular letter dated Sept. 15, 1914, notifying stockholders they deemed it necessary to suspend payment of the regular quarterly dividend on the preferred.

Income Account

The income account and statement of surplus in detail compares with 1913 as follows:

	1914.	1913.
Net earn.	$2,330,673	$4,958,342
Int. and divs.	76,879	66,940
Total profits	$2,407,552	$5,025,282
Less provision for:		
Deprec., etc.	$ 334,414	$ 600,887
Num. exhaust	204,064	241,004
Val. shrink	.....	220,000
	$ 538,478	$1,061,892
Net profits	$1,869,074	$3,963,390
Int.	840,326	862,090
Appble. for div.	$1,028,758	$3,101,300
Pfd. div.	875,000	1,750,000
Surplus	$ 153,758	$1,351,300
Prev. surp.	6,512,777	6,661,477
Total surplus	$6,666,525	$8,012,777
*Spec. appr.	51,236	1,500,000
P. & L. surp.	$6,615,289	$6,512,777

*In 1914 this amount was written out of surplus for premium on bonds purchased and for special taxes for prior years; in 1913 the appropriation was made for extraordinary depreciation and extinguishment.

Provision was made of $334,414 for depreciation and renewal of plants, which compared with $600,887 last year. In this connection the report says:

"In view of full allowances made heretofore for depreciation and of liberal expenditures for the current year's maintenance, under conditions of reduced output, the executive committee were of the opinion that some reduction in depreciation charges should be made."

For exhaustion of minerals provision was made to the amount of $204,064, as against $241,004 the previous year; this difference measures the decrease in output. For the year 1913 provision was made for possible shrinkage in value of raw materials to the amount of $220,000. No deduction was made on this score for 1914.

The average number of men employed in the north at ore and coal mines, ovens, furnaces and works was 7,344, compared with 9,898 in 1913, and 9,823 in 1912; in the south, 9,906, compared with 12,633 in 1913 and 12,298.

General Balance Sheet

The general balance sheet of the Republic Iron & Steel Co., as of Dec. 31, 1914, compares as with 1913 as follows:

Assets:—	1914.	1913.
Cost prop.	$68,220,589	$66,376,367
New constr.	1,024,082	1,844,223
Cash	797,291	1,827,098
Stks. oth. cos.	943,586	958,061
Raw & fin. material	7,779,430	7,454,745
Ore contr't	864,991	768,770
Acct. & bills rec.	2,783,919	3,777,611
Prepd. exp.	726,260	682,397
Total	$83,229,999	$83,781,065
Liabilities:—		
Pfd. stk.	$25,000,000	$25,000,000
Com. stk.	27,191,000	27,191,000
Potter Ore Co. bonds.	283,000	293,500
Skg. fd. bds.	13,305,000	13,305,000
1 year notes	3,000,000	1,500,000
M'ton Coke bds. & notes.	264,000	354,095
Accts. pay.	790,002	1,596,098
Div. warr.	187,158	374,316
Accrued int.	175,050	206,263
Accrued tax.	261,402	226,060
Ex. of min.	1,976,970	1,772,905
Dep. of plts.	3,088,021	2,988,310
Res. for rel. furnaces.	269,069	346,984
Ore con. bal.	244,080	204,073
P. & L. sur.	6,615,290	6,512,778
Total	$83,229,999	$83,781,065

Earnings for 15 Years.

Gross earnings and percentage of net earnings applicable to preferred dividends during the past 15 years compare as follows:

Year ending June 30.	Total profits.	Surp. per share, pfd.
*1914	$2,407,552	4.12
†1914	1,321,831	2.47
*1913	5,025,282	12.41
*1912	3,615,308	8.93
*1911	3,323,402	7.81
1910	4,227,369	11.06
1909	3,656,802	7.90
1908	4,046,689	9.80
1907	6,127,741	18.30
1906	4,750,476	13.40
1905	2,508,068	6.70
1904	1,306,068	....
1903	4,123,500	13.40
1902	3,260,077	11.10
1901	1,034,248	1.50

*Year ending Dec. 31. †Six months.

New Construction

Expenditures during the year on account of new construction which now completes all authorized improvements aggregated $1,070,608.68. The

outstanding first mortgage and collateral trust sinking fund gold bonds amounting to $613,000 were called Oct. 1, 1914, under the option contained in the mortgage securing such bonds. Funds were deposited with the trustee under the mortgage, and all bonds were surrendered and cancelled with the exception of 81 bonds which were outstanding as of Dec. 31. Therefore, with the refunding operation now completed, the 10-30-year 5 per cent sinking fund mortgage gold bonds become first mortgage bonds.

The total new construction up until Dec. 31, 1914, was:

Blast furnaces	$ 6,111,525.10
Steel plants, roll. mills and fac.	13,215,029.32
Ore mines, coal mines, coke ov. and quarries	6,056,656.44
Miscellaneous	288,596.31
Total	$25,671,807.17

There was no change in the theoretical blast furnace capacity during the year, capacity in the northern district remaining 880,000 tons and in the southern 1,195,000 tons. Pig iron production of the past three years compares as follows:

Year end. Dec. 31, 1914....	777,811 gr. tons
Year end. Dec. 31, 1913....	895,949 gr. tons
Year end. Dec. 31, 1912....	1,035,593 gr. tons

No expenditures were made at the bessemer steel plant, but the high state of efficiency has been maintained by liberal expenditures for upkeep. Production showed a material reduction, comparing with previous years as follows:

Year ending.	Ingots.
Dec. 31, 1914.....	391,826 gross tons
Dec. 31, 1913.....	611,833 gross tons
Dec. 31, 1912.....	682,285 gross tons

Brier Hill Finances

In connection with the formal public offering of $1,800,000 Brier Hill Steel Co. first mortgage serial 6 per cent bonds at par and interest by the First Trust & Savings bank, Cleveland, a detailed report of the condition of the company has appeared. It shows $9,107,000 common and $4,940,200 preferred stock outstanding, together with the present issue of $2,000,000 of bonds of an authorized issue of $3,000,000, the remaining $1,000,000 being held in the treasury of the company. Liens prior to the present issue total only $200,000. These are on subsidiary companies, all but $50,000 of which mature next year. Annual net earnings of the past three years were $563,000. The new open hearth steel works and rolling mill, costing the company over $5,000,000, were only gotten under operation the later part of last year, so that the figures as to net earnings are exclusive of any benefits to be derived from this modern plant. A condensed balance sheet as of Dec. 31, 1914, showing the condition of the company after making application of the proceeds of the present issue, follows:

ASSETS

*Plant and property	$9,189,179
Invest. and adv. to sub. comp.	4,771,643
Cash	280,146
Bills and accts. rec.	734,734
Inventory	2,997,231
Deferred assets	268,585
Total	$18,241,519

LIABILITIES.

Bonded debt	$2,000,000
Current bills	520,000
Accts. payable	703,596
Accounts	40,891
Reserves	117,049
Prfd. stock	4,940,200
Common stock	9,155,712
Total	$18,241,519
Surplus	764,070

*After deducting $200,000 bonds of subsidiary companies.

ending Dec. 31, 1914, net earnings averaged $1,515,850.61.

Part of the proceeds of this sale will be used in paying for two iron mines recently taken over from the Rogers-Brown Ore Co., known as Armour No. 1 and No. 2.

Shows Profits

Despite the unusually low prices and bad operating conditions of 1914, the Youngstown Sheet & Tube Co., Youngstown, O., was able to show a profit for the six months ending Dec. 31, 1914, sufficient to pay dividends at the rate of 7 per cent on the preferred stock and 8 per cent on the common, provide for the full depreciation charges for the period, interest charges on its bonds and on the short term notes it issued a short time ago to pay for extensive coal holdings in Pennsylvania. The company usually makes a report but once

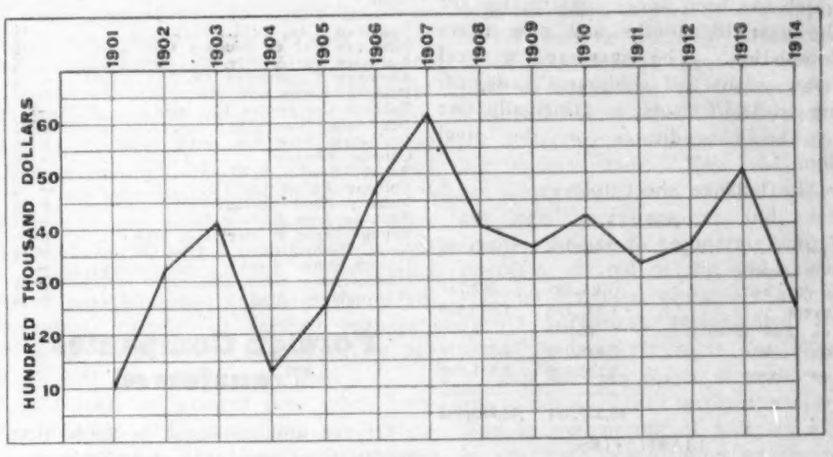


CHART SHOWING EARNINGS OF REPUBLIC IRON & STEEL CO., DURING PAST 14 YEARS

Inland Bonds

The First Trust & Savings Bank of Chicago is offering for sale $1,000,000 worth of 6 per cent extension and refunding mortgage bonds of the Inland Steel Co. Of a total authorized issue of $10,000,000, the company has issued $4,500,000 inclusive of the present issue. These are offered at 101 and interest, which will yield 5.92 per cent return. They are redeemable at the option of the company as a whole or any part on or after July 1, 1915, at 1.03 and accrued interest, on 60 days' notice. The security is a lien on all property of the Inland Steel Co. now owned or hereafter acquired, valued by the company now at $16,000,000, which does not include property to be bought with the proceeds of this issue. Net earnings for 1914, after providing for exhaustion of minerals and depreciation reserve, were $1,336,380.60. During the five years a year, but recently changed its fiscal period to correspond with the calendar year, and thus a new year began on Jan. 1.

About $300,000 was expended during the six months for improvements, according to reports submitted to stockholders a few days ago by President James A. Campbell. During the year ended June 30, 1914, a bonus of 3 per cent of their earnings for the previous year was paid the company's employes.

The company's business has improved greatly since the first of the year, January tonnage exceeding that of December by about 25 per cent, while its increase over November was fully 60 per cent. No action was taken by directors in the matter of contemplated improvements. Mr. Campbell mentioned that these extensions, concerning which some rumors have gone forth, are what the company would like to have and its

management dreams about and its engineers spend their spare time upon, but that he did not think the time was at hand when any action could be taken.

Earnings Decreased

The American Iron & Steel Mfg. Co., Lebanon, Pa., has issued its annual report for the fiscal year ended Dec. 31, 1914. Undivided profits are shown in the balance sheet to have been diminished by $206,321 during the year. In 1913 the company added $226,924 to its undivided profits. An allowance was made of $1,105,000 for depreciation in 1914, against $1,055,000 in 1913. James Lord, president, says:

"Decreased demand, with very low prices, was a feature of the entire year. A loan of $500,000 was made on account of the electric steel plant, which has been under construction for the past 18 months and now nears completion. The increase in 'real estate, plant and equipment', amounting to $1,376,889.41, is principally due to the expenditures on the steel plant."

The balance sheet follows:

ASSETS.

Cash	$462,102	$1,383,688
Bills receiv.	.....	.....
Acc'ts. rec.	302,489	391,737
Invent.	1,232,738	1,313,526
Ins. and taxes	16,903	8,490
Real estate	7,648,088	6,221,199
Less deprec.	1,105,000	1,055,000
	$8,557,321	$8,263,642

LIABILITIES.

Pfd. stock	$3,000,000	$3,000,000
Com. stock	2,550,000	2,550,000
Wages pay.	.....	.....
Acc'ts pay.	.....	.....
Bills pay.	500,000	.....
Undiv. profits	2,507,321	2,713,642
	$8,557,321	$8,263,642

Gold Coming In

New York, Feb. 16.—Gold now is beginning to flow into the United States from foreign countries, as the result of the low rate of exchange that now prevails. Announcement is made that the engagement has been concluded for $2,500,000 in gold, to be shipped to this country from Ottawa, Canada. It is rumored that another lot of $1,500,000 from Ottawa, is being arranged, and that the English government has decided to allow about $10,000,000 in gold to come to New York during the next few weeks, in an effort to restore the rate of exchange to a more nearly normal level. Demand sterling during the past week has ranged from 4.82⅝, a new low record on the present downward movement, to 4.83⅛. The importation of gold from foreign countries to the United States emphasizes the favorable trade balance which this country has been establishing in recent months and is regarded by bankers as a very satisfactory development.

Stocks Make Gains

The announcement by the United States Steel Corporation on Wednesday of last week that unfilled tonnage had made a gain of 411,928 tons had a stimulating effect on the market. The gradual increase of activity by the Steel Corporation and independent steel companies was also encouraging and nearly all of the leading industrial stocks made gains, those of the United States Steel, Republic Iron & Steel and Bethlehem Steel being especially noteworthy. The gains and also a few losses are shown in the following table:

American Can, prfd.	— ½
American Car & Foundry Co.	+1⅞
American Car & Fdy. Co., prfd.	— ⅜
American Locomotive Co.	+ ⅜
Baldwin Locomotive Co.	— ⅝
Baldwin Locomotive Co., prfd.	—1
Bethlehem Steel Co.	+2¾
Bethlehem Steel Co., prfd.	+1⅛
General Electric	+1¾
Pressed Steel Car Co.	+1½
Pullman Palace Car Co.	— ⅛
Railway Steel Spring	+ ⅞
Republic Iron & Steel Co.	+ ¼
Republic Iron & Steel Co., prfd.	+4
Sloss, Sheffield Steel & Iron Co.	+ ¼
United States Steel	+3
United States Steel, prfd.	+ ⅞
Westinghouse Mfg.	+ ¾

Foreign Companies Transferred

Official announcement is made that negotiations are being closed whereby the Societe Anonyme Westinghouse, of Havre, France, and the Societa Italiana Westinghouse, of Genoa, are being transferred to the British Westinghouse Electric & Mfg. Co., Ltd., of Manchester, Eng. Guy E. Tripp, chairman of the board of the Westinghouse Electric & Mfg. Co., has denied that the transfers in any way are an outgrowth of the war, and states that the British government had no connection with the transaction. According to Mr. Tripp, the English company has taken over the French and Italian companies as a matter of business policy, and that the American company by virtue of stock control in the English corporation would continue to dominate the other two companies. The French company has a capital of $5,000,000 and the Italian company of about $1,000,000. The British Westinghouse Electric & Mfg. Co., Ltd., was organized in 1899 with a capital of $7,275,000. The parent concern in this country holds more than half of the stock of all these companies.

Rules for Acceptances

The federal reserve board in issuing regulations governing the dealing in acceptances has provided a method which it seems probable will greatly facilitate the exporting of iron and steel products and machinery. Member banks may purchase acceptances in the open market, but the board expresses a preference for discount of such paper only when presented by member or other banks. An important provision is the rule that acceptances must be payable in dollars in the United States. In the past, the movement of American products to foreign countries has been hampered very much by the necessity of doing business through London or Germany. Commissions were received by English and German bankers and foreign bankers were in a position to obtain much valuable information concerning the business of Americans. The working out of this new system will be awaited with keen interest not only in the United States but in foreign lands.

Financial Notes

The Krit Motor Co. and the Krit Sales Co., Detroit, were sold in bankruptcy court at that city recently. Samuel Winternitz & Co., of Chicago, were the purchasers, paying $120,000 on a liquidating basis. The privilege of having the price reduced 2½ per cent if liquidated within 90 days was given. A certified check for $12,000 and bonds for $25,000 were received from the purchaser. Assets of the Lozier Motor Co., Detroit, were disposed of at the same time by Referee Joselyn. The sale was made for $1,000,000, to Frank Bros., Harris Bros., Charles Shongood and Theodore Friederberg, on a liquidating basis.

The American-La France Fire Engine Co. reported net earnings of $350,645 for the year ended Dec. 31, a gain of $112,491. The surplus after paying 7 per cent dividends on the preferred stock was $210,645, and the profit and loss account amounted to $310,208. The directors declared a dividend of 1 per cent on the common stock, payable Feb. 15, out of the earnings for 1914.

John G. Benedict and L. D. Gilbert have been named as receivers for the Waynesboro Metal & Foundry Co., Waynesboro, Pa. The insolvency of the Westminster Metal Foundry Co., Westminster, Pa., a creditor of the Waynesboro company, is said to be the main reason for the receivership.

What Will Trade Commission Do?

Has Power to Investigate Foreign Trade and Make Recommendations to Enable Americans to Unite in Extending Trade

BY S E ELDRIDGE*

PRESIDENT Wilson, Sept. 26, 1914, approved an act of the sixty-third congress known as the "federal trade commission act," the law becoming effective on the date of approval. By the terms of this measure, a commission is appointed with enhanced powers, superseding the bureau of corporations.

Since the passage of this act, four months have elapsed during which period our financial, industrial and transportation interests have been tried to the straining point. In fact, conditions bid fair at one time to produce one of the greatest commercial and financial calamities in our history and had it not been for the instantaneous action, tempered with keen perception and a patriotic spirit, of our more sober-minded leaders of business, this calamity would have been a thing of grim reality.

Neither must we, in this connection, overlook the part played by many of our governmental officials, those especially who have shown a willingness and a sincere desire to co-operate with our men of affairs in the restoration of confidence and the return of conditions to something akin to normal. Likewise we must not lose sight of the good influence exerted generally by bringing into action the federal reserve system of banking and a recent decision of the interstate commerce commission granting to eastern railroads a slight increase in freight rates. Along with these we have the assurance from high administrative authority that the policy of the government towards big business shall be one of a helpful nature, rather than what has been considered in the past an attitude of interference and antagonism.

In view of these things, we are sanguine as to the future both in regard to our domestic prosperity and foreign trade. Especially are we concerned with the future activities of the federal trade commission and the immediate steps this body will take with respect to our foreign commerce. It seems, almost as a necessity, that the misfortune of others should be the instrument through which our attention has been focused upon some very important questions concerning conditions obtaining and encountered in campaigning for foreign trade. A conspicuous and important consideration seems to be the manner in which our exporters are compelled to attack world markets and the obstacles met with. Unity of effort, prohibited as between competitors in domestic trade, is also denied them by the same instrument of law in going after foreign business.

Prescribing of a remedy rests with the federal trade commission and by reference to Section 6, clause h, of the act creating the commission, it is observed that certain specific duties are imposed with respect to our foreign commerce. In order that our foreign trade may expand along healthy, unrestricted and profitable channels and meet the competition of other countries on a fairly equal footing, it seems reasonable to expect that among the first considerations of the commission should be the matter of our foreign commerce. Particularly, this body could devote considerable time to the investigation of associations, combinations and so-called 'cartels' of foreign manufacturers with which our exporters are forced to compete overseas.

Under our present laws, such combinations and associations are forbidden, likewise agreements whereby interests of competitors may be pooled; these applying not only in our domestic commerce but our foreign trade as well. This simply imposes a handicap since such combinations and agreements are permitted and in some instances compulsory by law in other countries, particularly Germany, and as a result exporters in foreign lands attack world markets with forces combined which naturally lowers selling costs, unifies interests and climinates conflicting, inefficient and lost-motion methods.

The section and clause of the act previously referred to reads as follows:

"To investigate, from time to time, trade conditions in and with foreign countries where associations, combinations or practices of manufacturers, merchants, or traders, or other conditions, may affect the foreign trade of the United States, and to report to congress thereon, with such recommendations as it deems advisable."

Thus the authority, the trade commission itself the instrument and the means. The language of the act is clear and to the point, leaving little doubt as to the intent and purpose of its framers. Although the last clause in the section, this in nowise belittles its importance or the diligence with which the commission should act in complying with the provisions thereof.

The importance of and the degree of our dependence upon an unhampered foreign commerce has been clearly and somewhat poignantly demonstrated during the past six months. While all are more or less familiar with the more important contributory causes leading to this break-down, yet it is somewhat apparent that this state of affairs has been necessary to a more comprehensive appreciation of the problems that have beset us in our export trade. Now that these are squarely before us, it behooves our legislative, executive and administrative bodies to co-operate with the interests affected to the end that all may be benefited ultimately and our export commerce emancipated from unjust and unreasonable restrictions.

Therefore we have in view such amendments to our present anti-trust laws as well permit of unity of effort or syndicate organization on the part of our producers and manufacturers in their efforts to extend export commerce. This is believed to be absolutely essential if exports are to expand further and our exporters successfully meet opposing elements in world trade which are now so well fortified behind great combinations of capital and centralized effort. For thought and action in this direction it is natural that we now turn to the trade commission, entertaining the highest hopes that this be numbered among the earliest accomplishments of that body.

This is a matter of more or less importance to all industry of this country, in some cases one of vital significance; therefore, it seems to be no impropriety to urge that each and every one interested, directly or indirectly, use such influence with his representative in congress as will weigh in favor of the recommendation emanating from the trade commission having for their purpose the unshackling of our exporters.

*Duquesne Works, Carnegie Steel Co.

Problems of Capital and Labor

What is Being Done to Relieve Unemployment in Manufacturing Centers—Thousands Are Given Work

Chicago, Feb. 16.—Efforts of business men of Chicago to relieve present conditions of unemployment have been a matter for much thought. Public bodies have had the matter under consideration and an effort was made to interest moneyed men in a project for raising a fund of $500,000 to pay men to do betterment work for the city, street cleaning, work on parks and boulevards and the like. Opposition to this developed and the effort was given up.

Within 30 days, a start will be made clearing the site for the new railroad terminal on the west side, in which a number of railroads are to participate. A force of 1,000 men will be put at work there as a starter and additions made as rapidly as possible. As $65,000,000 will be spent for this project, a small army of men will be employed eventually.

A system has been devised by which residents of Chicago furnished blue cards of identification by a city bureau and holders of these cards will be given first opportunity at the positions as quickly as they become available.

A recent conference of employers resulted in Julius Rosenwald, of Sears, Roebuck & Co., mail order dealers, offering to provide work for 100 men. Part of these were set at work pulling nails from boxes, others at painting and the remainder were scattered here and there through the plant where something could be found for them to do. The Crane Co. likewise provided for 50 men in a similar way.

Other employers have taken on smaller numbers where possible, preference being given residents of the city and married men.

The municipality has kept as large forces as possible busy through the winter on watermain extensions and such other work as could be pursued in cold weather.

The general policy has been to shorten time rather than to discharge a corresponding portion of their forces and thus a larger number of men were provided part work through the winter.

Resumption of work at the Gary works of the Illinois Steel Co., at Gary, Ind., and at the South Chicago works of the same company has provided employment for a considerable number of men and there have been increases at other plants as well, though the number of unemployed still is immense.

Many of the men out of work here are stragglers who gravitate to a city in the winter and for whom the city really has no responsibility. These men are here every winter, no matter what the condition of the labor market, and are not a real factor except as they swell the apparent total of men idle.

Cleveland's Fund for Jobs

Cleveland, Feb. 16.—In spite of the efforts of many employers in Cleveland to prevent unemployment by working as many men as possible at least on part time, the number of those who have been unable to get any work has been large during the past two or three months. Never before in the history of industrial depressions in this city was so much done to obtain jobs for men. This was accomplished by urging employers to keep as many as possible on their payroll and by raising a fund to provide employment. Under the leadership of Charles E. Adams, president of the Cleveland Hardware Co., as chairman of a citizens' committee, a fund which up to last Saturday night amounted to $78,112.60 has been raised and jobs outlined will furnish 27,630 full days' work to the unemployed. The work will be principally in the city parks, under the direction of city officials and a committee of citizens.

As a result of the co-operation of employers and employes, steps are being taken by Mayor Baker, Mr. Adams and others to make an exhaustive study of the unemployment problem with the idea of reducing unemployment during future periods of depression.

An interesting feature of the recent campaign to raise funds was that there was only one very large contribution, that of Samuel Mather, for $10,000, and the contributors included 1,706 individuals, 112 firms, 258 groups of employes and nine banks.

It was found that of 1,288 men registered at the State-City Employment Bureau as destitute, only 10 were found not worthy of work. In providing work from the funds subscribed by citizens, those in charge have been careful to give it to the most worthy.

Novel Schedules at Pittsburgh

The city of Pittsburgh has spent approximately $150,000 since last October to offer relief to the army of the unemployed at that center. The above sum was appropriated by council to undertake municipal improvements that would not have been considered, under normal business conditions, until next spring. Thousands of men have applied for work, and the city has been able to offer employment to 3,700 "bread winners". Men employed by the highways and sewers department of the city, usually idle during the winter months, have been retained at half time.

The city built a municipal ball grounds in one of the public parks, extended streets in various sections of the city, laid out park systems and made numerous municipal improvements to give employment to as many as possible.

Numerous mills in the Pittsburgh district, operating at 50 per cent capacity and less for many months, adopted interesting and somewhat complicated schedules in order to give work to a maximum number of employes. So far as possible, normal operating forces were divided into two sections immediately after reduced operating schedules became effective. One section was given employment for periods ranging from three days to two weeks, and then the other division was engaged. The adoption of this system reduced hardships to a minimum.

Gary Leads in New York

New York, Feb. 16.—Various methods are being invoked at New York City, to meet the problem of the unemployed and the poor in the metropolis at this time, and the services of many of the city's prominent men and women have been enlisted in this cause. The number of unemployed in the Greater City is estimated at 200,000 over a year ago. The general study and handling of the matter is in the hands of a Committee on Unemployment which has been appointed by Mayor Mitchel. Judge E. H. Gary, of the Steel Corporation, is the chairman of this committee and many of the city's wealthiest and most philanthropic persons are members. Both President Wilson and Governor Whitman have shown interest in this

Problems of Capital and Labor

What is Being Done in South to Aid the Unemployed—Remarkable Proposal in Danbury Hatters' Case

movement and are lending such co-operation as is within their command. Contributions are being sought from such persons as are able to give and this fund is being used both to provide means of employment and to assist financially those who are out of work. A number of workshops have been open for both men and women in various buildings in the metropolis. Unemployed persons are provided with work in these shops and are paid a small amount daily. Such articles as they produce, which usually are of the character of wearing apparel, etc., they are permitted to take home for their own use or are distributed among the other poor. A "Bundle Day", recently engineered by the women of the committee, was held with great success, when the public was asked to gather old apparel and other useful articles in the homes and to contribute them to the committee.

Judge Gary has suggested that the city of New York push forward at this time all such public improvements as it may have in view for the near future. This matter still is before the municipal authorities. The committee is contemplating the establishment of a loan fund to which the needy may have access. Another proposal that has been made is for every resident in a certain block to contribute 10 cents daily for a week for street cleaning in that district. With this fund, it is believed, a great many idle men could be put to work.

Plants Kept Going in the South

Birmingham, Ala., Feb. 15.—Industrial leaders of the Birmingham district have done much in the past several months to take care of their employes whose livelihood was threatened by the business depression. No organized and co-operative movement was started, but much individual work is being done.

Those who come into close daily contact with the business affairs of President George Gordon Crawford, of the Tennessee Coal, Iron & Railroad Co., know well how much time and thought he has given continually to the welfare of the thousands of employes of his company whose wages stop the instant his operations stop. While no public statement has ever been made by any of the Tennessee company officials, it is well known that for three or four months during the fall and through December President Crawford ordered operations at the company's steel rail mill and other departments solely to afford the company's employes a source of income. The rail mill of this company, especially during the last few months of 1914, kept up a schedule of operations every other week, so that the employes would have some money.

This same plan has been followed by practically every industrial concern in the district. All of the furnace interests admit that activities were kept up and thousands of tons of iron smelted last fall when there was no market for it, all for no other reason than to give work to employes. The Sloss-Sheffield Steel & Iron Co., the Republic Iron & Steel Co., the Woodward Iron Co., and others, when a decrease in operations finally became compulsory, practiced the plan of permitting employes to live in company-owned houses without rent and when in actual need to draw on the company's commissary for food without price.

The City Employment bureau has found work for many men in Birmingham. It is fostered by all the interests connected with the problem, the clergy, the trades unions and the industrial corporations. Its services have been free and it is still securing employment for many men.

Several hundred men for the past few months have been given employment by the city government at cutting cross-ties and mine props on a piece of wooded city property a few miles from town. Men were paid by the cord and were able to make a good daily wage, the mining corporations agreeing to buy from the city all of the props and cross-ties thus manufactured. Skilled mechanics and artisans of every trade were to be found in this pine forest cutting timber, the work being in charge of the city street commissioner.

The Birmingham Trades council has secured the co-operation of the motion picture theaters and all proceeds of the theaters on Sunday are turned over to the council for the aid of the unemployed, this sum last Sunday amounting to $350. Two weeks ago a "White Streamer" day was held, during which every citizen having clothes or any article of value to those in actual need placed a white streamer on the door and scouts in automobiles thus gathered a couple thousand dollars' worth of clothes, food and cash, which has been distributed among the families in actual want.

An Astonishing Proposition

Washington, Feb. 16.—House members of the Connecticut delegation in congress have apparently faltered in their proposal to make the United States pay the fines and costs assessed against members of the hatters' union in the Danbury boycott case.

Supported, it is believed, by the American Federation of Labor, Martin Lawler, one of the principal defendants, came to Washington last week and appealed to four members of the Connecticut delegation, Representatives Mahan, Donovan, Reilly and Kennedy, but failed to see the other, Representative Lonergan, who was out of the city. The four members drew up a measure providing for the reimbursement of the hatters, out of the United States treasury, of the damages, costs and interest, aggregating $290,000. When the bill was presented to the house clerk, he refused to receive it unless it was offered separately by the representatives. Since then nothing has been done in the way of introducing bills. The remarkable proposal may have been reconsidered by the representatives, it is said, and abandoned.

Mr. Lawler based his plea on the ground that the enforcement of the judgment would entirely ruin most of the defendants, taking all their savings and their homes. Moreover, he said the government should assume the obligation, which it itself found rested against the hatters' union. Congress, Mr. Lawler said, never intended the Sherman anti-trust law to be applicable to labor organizations. The suit was brought against individuals and not against the union, Mr. Lawler declared. He made no comment on the finding of the supreme court that the Sherman law applies to labor as well as other organizations and that individual members of a union are responsible for the acts of its officers.

According to Herman F. Lee, secretary of the American Anti-Boycott Association, the defendants are mistaken when they say enforcement of the judgment will ruin them. In a

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Buffalo Concern Makes Interesting Experiment in Profit Sharing—Theodore Kundtz Inaugurates Similar Plan—New Member of Arbitration Board

statement given out in New York, Mr. Lee is credited with saying that in each case in which hatters became defendants in the Danbury suit, the defense was undertaken by the union on the specific agreement that the defendants should not be put to any expense or be liable for any judgment.

A Buffalo Profit Sharing Plan

An interesting experiment in profit sharing was inaugurated last year by the Acme Steel & Malleable Iron Works, Buffalo. An account was opened with the Commonwealth Trust Co. under the name of "The Acme Employes", by E. G. Felthousen, trustee, who made this announcement:

"The bank will allow 4 per cent interest quarterly on the money deposited, and we will agree to pay each depositor a dividend out of the earnings of the Acme Steel & Malleable Iron Works, equal to 4 per cent interest on quarterly balances to the credit of each depositor, providing the earnings of the Acme Steel & Malleable Iron Works amounts to 4 per cent on the capital invested. If the earnings should be less than 4 per cent, we will pro-rate the dividend in accordance with the earnings.

"We hope our employes will embrace this opportunity to receive as large an income on the money they have on deposit, as the Acme Steel & Malleable Iron Works receives on the money it has invested in the business; for it is our wish that employes, if they desire, may have equal profits with us, without the liability of loss which all employers of labor assume.

"Employes may deposit money with our bookkeeper, in amounts of not less than one dollar at one time, and he will transfer all money received to the Trust company.

"Money may be withdrawn at any time, including interest on quarterly balances; but if an employe ceases to be in our employ prior to Jan. 1, 1915, he must withdraw the money he has deposited, with interest due at the time he leaves our employ, and he will not participate in the profits of the business."

In reply to an inquiry as to the results of the plan, President Felthouser writes THE IRON TRADE REVIEW as follows:

"Our profit-sharing plan, as outlined in our letter of Jan. 2, 1914, to our employes is working very satisfactorily in every respect, so far as the general scheme is concerned.

"About 80 per cent of our employes have taken advantage of our proposition, but unfortunately, owing to the depressed condition of our business, the day workers have been unable to work full time during the past few months, and this has made it necessary for nearly all the day workers to withdraw the funds which they had deposited in the Acme employes account. However, all of the employes who are working on a salary have continued to increase their deposits, some of them having quite a large amount on deposit.

"We do not limit the amount which an employe may deposit, as we consider he will take a deeper interest in the profits of the business, according to the amount of money he has on deposit.

"In thinking over this scheme, it may strike you that while this proposition is a good one for the employes, it must be very expensive for us, but our experiences convince us that it is a profitable investment for us.

"We believe that as soon as a working man begins to save money he becomes a better workman, and as soon as he realizes that his income is increased as the profits of the business increase, he necessarily must take an interest in the production secured by the men to produce the necessary profits.

"We believe our proposition far superior to having employes own capital stock in the business. We do not think it fair to ask an employe to buy capital stock which is not marketable. The average manufacturing stock certainly is not marketable unless it be listed with some exchange.

"Our employes are reasonably sure of receiving 8 per cent interest and dividend on the money they invest; they are absolutely certain of receiving 4 per cent on their money, which you will note is paid by the bank having the money carried for the Acme employes account.

"The employe has the privilege of securing his money at any time he may desire, and from the fact that he will likely receive 8 per cent on the money he has invested, he is receiving more than the average dividend paid by our most successful corporations.

"The clause compelling an employe to withdraw his money when he leaves our employ and forfeit his right to participate in the profits if he leaves prior to Jan. 1, is a very valuable condition for us.

"From our short experience with this proposition, we are perfectly confident that as soon as business revives we will have no trouble in inducing 90 per cent of our employes to take advantage of the opportunity we offer."

Will Share Profits

Theodore Kundtz, manufacturer of furniture, Cleveland, has decided to incorporate his business with a capital of $2,000,000. The workmen are to acquire, by methods to be decided partly by themselves, $750,000 of preferred stock, and will receive guaranteed dividends of 7 per cent annually. Common stock to the value of $1,250,000 is to be controlled by Mr. Kundtz. There will be a pension system, partly under the control of the workers. Mr. Kundtz, who is 62 years old, started a cabinet shop in 1875. His business grew steadily.

Appointed Arbitrator

Clifton Reeves, president and general manager of the Reeves-Cubberly Engine Co., Trenton, N. J., has been named by Secretary Wilson of the government department of labor as a member of the federal board of arbitration. He has been detailed to a particular labor problem in the south. The position is a lucrative one. Mr. Reeves has always been active in labor matters. For ten years, he was secretary of the Employers' association of Trenton, during which time he assisted in the adjustment of several labor differences. He was also active in bringing about a settlement of the big strike of union machinists a short time ago.

The New Jersey Manufacturers' Association, Trenton, N. J., has named a committee to select a site for new headquarters in Trenton. It is the purpose of the association to erect a handsome building, where various manufacturers and associations may hold meetings and find a suitable club room. John W. Foster, superintendent of the Straus Woolen Co., of Trenton, is chairman of the committee.

Knocks Out Dissolution Suits

Brought by Government Against Shipping Combines—Decision of United States Court is of Large Significance to Business World

THE recent decision of the United States district court at New York in what were known as the government dissolution suits against alleged shipping trusts was very significant and much that was said in the opinion written by Judge Lacombe and concurred in by his three associate judges is of interest not only to those engaged in shipping but to all manufacturers. The suits were against the companies comprising the so-called Brazilian Steamship Conference and the companies comprising the Far Eastern Steamship Conference.

In the opening remarks of his decision, Judge Lacombe said that the combinations had been practically dissolved as the result of the European war. The most important parts of his decision are as follows:

"The defendants wished primarily to make money for themselves; there is no sentiment in business; but they reasoned, no doubt, that if they kept their rates so regulated in co-ordination with European rates as to give a United States shipper reasonable assurance as to what he had to meet in competition and a fair parity as to rates and also gave him proper and sufficient sailings with opportunity of changing engagements, the trade would be stimulated, would grow more readily than under the old uncertain conditions, and with its growth the combination would gather in its share of the financial results. The event seems to have justified their expectations. In the mere initiation and carrying out of the enterprise outlined above we see no unreasonable or abnormal restraint of trade.

"It is contended that the rates charged by the combination have been unreasonable. Examination of the testimony does not persuade us to this conclusion. Conditions of carriage on the ocean are peculiar, its waterways are open to all, tramps and chartered vessels may pass from port to port without acquiring franchises or condemning rights of way. In one sense, as a witness graphically expressed it, 'ocean freights are as unstable as the water itself.' Regular rates, normally reasonable, are not to be held unreasonable because at some time and place one or more tramp steamers are willing to cut them deeply rather than sail to their next port in ballast. A test sometimes used when inquiring into reasonableness of rates is the cost of service. Thus tested the evidence indicates that the rates charged by the combination, regulated as they were in co-ordination with European rates, as a rule covered merely cost of service and a reasonable profit—indeed a small profit; for the competing line, which shaded down defendant's rates very little, ran frequently at a loss. Testing the rates by comparison with general ocean freights leads to a similar conclusion; such increase of rates as there has been from time to time seems to have been entirely normal following the upward movement of general ocean freight rates.

"It is contended that the system of rebates adopted by the combination was a restraint of trade. Rebates at a stated percentage were given to exclusive shippers; their payment was deferred so that it could be determined at the close of a rebate period whether the shipments of the concern asking for it had really been exclusive. It is, of course, desirable for a shipper to know in advance what rates he is to be charged; in like manner it is desirable for a carrier to know as definitely as it can what amounts of cargo it may expect it will have to handle in a given period. These rebates were not secret, nor were they confined to a favored few; they were uniform, were open to all and all were invited to avail of them. The arrangement is probably as old as trade itself. One natural result of it would seem to be stability in sailings and service—both desirable for trade—which might not otherwise be maintained.

"If the price of a unit of cargo space be assumed to be 50 cents, the 10 per cent rebate brings it down to 45 cents. Since the line has been doing business with the 10 per cent rebate it must be assumed that (in the case taken as an illustration) 45 cents per unit is remunerative; that it covers cost and a reasonable profit. It does not seem to us, however, necessarily to follow that the 45 cents would be remunerative if it were not coupled with the agreement for exclusive shipments. A line providing regular sailings and undertaking to furnish sufficient space will presumably learn by experience enough of conditions at the several ports at different seasons to enable it to calculate with reasonable accuracy what amount of cargo it may expect from its shippers for any particular sailing. Making provision accordingly the vessel sailing will take her departure with substantially a full cargo. But if when she reaches port, it is discovered that the calculations as to expected cargo were correct, but that some of her largest regular shippers had sent their merchandise off the week before by some tramp steamer, the regular vessel will have to sail with much unfilled cargo space. A few experiences of this sort might well involve a loss equal to if not in excess of the 10 per cent. We think the two things, rebate and exclusive shipments, are so closely and normally coupled together that in substance the situation is the same as it is when a lower price per unit is quoted for large shipments than for small ones. Such differentiation of price charged between large and small shipments is not unreasonable. Int. C. C. vs. B. & O. R. R., 145 U. S., 263.

"It is charged that defendants have refused to carry cargo at their own berth rates when there was unengaged space in their vessels. There is no attempt to prove this against all the defendants. Between one of them and the single shipper who makes the charge there was generated from prior transactions, occurring before the combination, a degree of heat which has probably warped the testimony on both sides as to this refusal. The one side, admitting refusal in a few instances, asserts that there was not unengaged space at the time of refusal, an assertion not necessarily proved false by the vessel's subsequently sailing with some free space—prior engagements may have been cancelled. Witnesses for the shipper admit that their tenders of cargo were in the hope of 'making out a case', either for action for treble damages or the initiation of this suit by the United States. The evidence is generally unsatisfactory, and it is hard to say where the truth lies, but, on the whole, we are inclined to condemn such practices by granting an injunction against the combination of defendants and its component members prohibiting refusal to receive cargo offered at their regular rates, unless for good cause shown.

"In view of the fact that the logic of events has turned this investigation into an autopsy, instead of a determination of live issues, it seems un-

necessary to discuss the persuasiveness of the proofs offered to show that the percentage of outward cargo from the United States carried by defendants grew from 51 per cent in 1908 to 54.7 per cent in 1912. There may be a decree for injunction as indicated supra without costs; in all other respects the bill is dismissed."

Arthur Keen

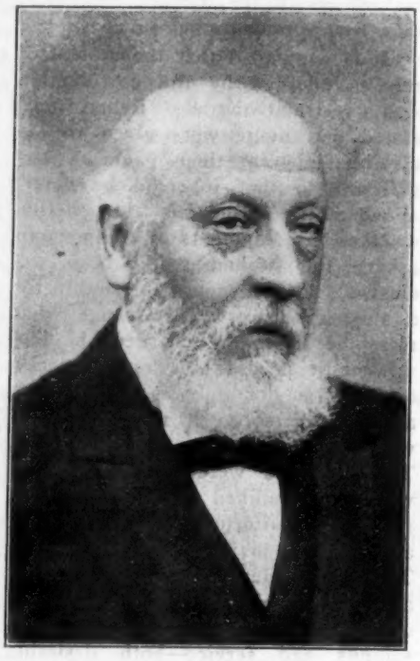
Eminent Iron Master of England, Dies at Age of 81

A cablegram to THE IRON TRADE REVIEW from Birmingham, Eng., announces the death of Arthur Keen, one of the most distinguished steel manufacturers of Great Britain. Mr. Keen's career was remarkably successful and interesting. He was born in Cheshire county in 1834 and his first employment was in a minor railroad position. His career as a manufacturer may be said to date from his introduction, about the year 1854, to an American inventor, who had come to Smethwick. Mr. Keen was then engaged as goods agent at Smethwick on the London & North Western railway. The inventor was a Mr. Watkins, who held an American patent for making nuts and bolts. Mr. Keen was without manufacturing experience, but had faith in the invention, and obtained financial backing for the firm of Watkins & Keen. The Patent Nut & Bolt Co. succeeded Watkins & Keen. The first week's wages of Watkins & Keen did not exceed £12 10s. The Patent Nut & Bolt Co., at the close of its trading as an independent concern, paid weekly £6,000.

Mr. Keen's business capacity and energy soon changed his position from that of junior partner to that of head of the firm. Mr. Watkins retired before long, and one by one, rival firms withdrew from the field or joined Mr. Keen. In 1864, this process of absorption culminated in an amalgamation with the firm of Weston & Grice, and the acquirement of the united businesses by the Patent Nut & Bolt Co., Ltd., including the Crown Brass Works near Newport, having a capital of £400,000, with its head office at the well-known London Works at Smethwick, near Birmingham. Arthur Keen took the position of managing director, and subsequently became chairman on the death of Sir Joseph D. Weston. For some years Mr. Keen was a director of Bolckow, Vaughan & Co., one of the largest steel-making firms in the kingdom.

The crowning successes of Mr. Keen's career as a captain of industry came at the beginning of the new century. A combination of the Patent Nut & Bolt Co. with the Dowlais Iron Co., having large and important collieries and works in South Wales, resulted in the formation of a new company under the style of Guest, Keen & Co., Ltd., with a capital of £3,000,000, and afterwards the undertaking of Crawshay Bros., Merthyr Tydfil, was acquired. At the first annual meeting, a net profit of £367,000 was reported, and the ordinary shares had more than doubled their value on the market.

The triumph of this amalgamation, however, was eclipsed by the announcement, Jan. 23, 1902, of an arrangement for uniting with this great business the world-famous undertaking of Nettlefolds, Ltd. The new firm took the style of Guest, Keen & Nettlefolds, Ltd., with Arthur Keen as



ARTHUR KEEN

chairman of the board, and the capital of the new company was increased accordingly. The united firm controls a nominal capital of £5,000,000 and employs about 30,000 workpeople.

Of the Liberal party, during its ascendancy in the Birmingham area, Mr. Keen was one of the leaders. He followed Joseph Chamberlain in the recession from the Liberals and became a prominent Liberal Unionist. In 1904, he became a member of Mr. Chamberlain's tariff commission. On several occasions, he acted as an arbitrator in labor disputes.

Mr. Keen was a vice president of the Iron and Steel Institute, and of the Institute of Mechanical Engineers. He leaves three sons, of whom two are directors of Guest, Keen & Nettlefolds.

New Hospital

At Youngstown Highly Praised by Dr. Darlington

One of the most modern and best equipped hospitals in the country has just been completed at Youngstown, O., and is now receiving patients. The new hospital, St. Elizabeth's, is the first of a hospital group to be erected in that city and represents an investment of nearly $300,000. The building is of Italian renaissance design with gray brick exterior, and is 47 x 150 feet. The interior construction is of steel and fireproof tile laid in Keene's cement.

To conclude the dedication services, a banquet was held at the Hotel Ohio, at which Joseph G. Butler Jr., who has been an active worker for the new hospital, presided as chairman. Bishop John P. Farrelly, of the Cleveland diocese, spoke briefly on the success of the undertaking, and, in behalf of the sisters and the diocese, thanked the mayor, the city council and all who had aided in the work.

Dr. Thomas Darlington, head of the welfare work of the American Iron and Steel Institute, was one of the speakers and told at length of the relations of a hospital to the welfare work of a community. Dr. Darlington said the new hospital is in the very forefront of such institutions in this country and some of the ideas embodied are in advance of anything to be found in the United States.

Several other speakers addressed the banquet. Guests to the number of 275 were seated in the banquet hall.

Rogers-Brown Anniversary

The thirty-fourth anniversary of the founding of the firm of Rogers, Brown & Co., manufacturers and dealers in pig iron, coke and alloys, was celebrated on Feb. 10 and 11 at the Business Men's Club, Cincinnati. All members of the firm and employes of the Cincinnati office and about 50 representatives from the various branches of the company throughout the country were present. The morning and afternoon of Feb. 10 were spent in business conferences and in the evening D. B. Meacham, a member of the firm, entertained those in attendance at his home in Avondale. On Feb. 11, a luncheon was served at the Business Men's Club and further business conferences in the afternoon closed the reunion.

Articles of incorporation have been filed for the Ideal Steel Barrel Co., of New York City.

How to Keep Your Men Healthy

Importance of Physical Examination in Preventing Accidents —Dangers From Eye-Strain

BY STEWART C COEY

THE RECENT growth of the safety movement and the enactment of the workmen's compensation laws in a number of states, has brought to the attention of all concerned the advantages of physical examination of employes. If the idea on the part of the employer were to get only physically perfect men, then the ultimate result of physical examination would be that employers would be unable to get men enough to run their plants, as the physically perfect man is hard to find.

The idea of physical examination as it is being worked out by many of the companies who are going into the matter, is not only to eliminate men who are unsafe to work, but primarily to place men in positions where there will be the greatest safety to them and to their fellow workers. For example, it is not safe for a color-blind man to be a railroad engineer, while he would prabably be entirely satisfactory for other positions. In iron and steel plants it is poor policy to put a man with weak lungs to work in a galvanizing room or bottom house, while it might be the saving of such a man to put him on some other kind of work and explain to him what he should do to protect his health.

As applied to electrical work around steel plants, physical examination is important from two viewpoints. It will tend to eleminate certain men from electrical work and will afford a check on the effect of electrical illumination on the eyes of the employes in general. This latter result will become more apparent when the records of periodical examinations of the men can be obtained.

Organic heart disease is undoubtedly the most dangerous affliction for electrical workers who are more or less subject to shocks. I have known of cases where men have been killed by electric shocks, that would have little or no effect on the ordinary man. I have in mind one man who touched the terminals of a voltmeter on comparatively low voltage and was killed. In this case it was known that he had heart disease, but there are any number of cases that come up from which the same conclusion can be drawn. Very often organic heart disease is the cause of dizziness and I think we all have known of men who have fallen from great heights in which it was impossible to tell what had been the contributing cause of the fall. At the Youngstown Sheet & Tube Co. we had one case of a man who was employed on work that made it necessary for him to climb considerably. He fell and hurt himself while on the ground and on examination it was found that this man was subject to dizzy spells. His job was changed to one in which there was no climbing and by this means he was probably saved from a bad fall and the company from paying damages.

Decayed teeth will in time interfere with nutrition, causing stomach troubles and constipation. Kidney trouble is often the cause of general inefficiency and may cause retinites which interferes with the vision. Deafness in a marked degree is dangerous for the man who depends for his safety on his ability to hear orders and danger warnings. Defective vision on certain work affects not only the personal safety of the man but also the safety of others. Periodical examination of the men will probably be the means by which a large percentage of these defects will be caught at their inception in the future and cured or halted before they have time to develop to a point where they are the cause of accidents.

Effect of Arc Welding on Eyes

Periodical examinations as affecting the eyes are especially important for men engaged in electric welding work. In most plants where an electric welding equipment is used, proper attention is not paid to the effect of the ultra-violet rays given off by the electric arc. Great care is taken in getting the best type of motor-generator set, switchboard, control panel, etc., and then a helmet is constructed using a blue glass, which has been found fairly efficient for use in viewing the bessemer converter or open-hearth flame. Very often this is apparently satisfactory and no bad effect is noted except that the operator may complain of a constant headache.

Ultra-violet rays occur in any flame having a temperature above 2,000 degrees Fahr. They have to be protected against in viewing bessemer and open-hearth flames, both of which have a temperature of approximately 3,600 degrees. The effect of these rays increases rapidly with an increase in temperature and the oxy-acetylene flame at 4,350 degrees has to be protected against more than any of the flames ordinarily met with in iron and steel plants. At the temperature of the electric arc, which runs from 6,200 to over 6,400 degrees Fahr., these ultra-violet rays will probably cause permanent blindness in a very short time by the destruction of the animal tissue in the eye. We have had cases of men who watched the electric arc for a minute or so without eye protection who have been temporarily blinded from this effect. In considering the proper glass for use with the electric arc, care must also be taken to get a glass that cuts down the intrinsic brilliancy of the light as well as eliminating the ultra-violet rays.

I would call your attention to the following points that are of importance when considering the effect on the eyesight of illumination. While the eye is so constructed that it adjusts itself to a wide variation in the intensity of light there must be sufficient light so that objects can readily be seen by means of the light they reflect, otherwise the eyes will be strained and the vision impaired. For this reason more light must be thrown on dark objects to get an equivalent result, than it is necessary on light colored objects. Then again more light must be used where fine work is done, such as draughting, than is necessary in a blooming mill. Lack of sufficient light has always been one of the greatest causes of eye fatigue and consequent defective vision.

An exceedingly important factor in view of the recent developments in incandescent lamp manufacture, and one to which I call your special attention is the danger to the eyes of having filaments of high intrinsic brilliancy within the field of vision. It is usually assumed that a light source of an intrinsic brilliancy of

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Paper read before Association of Iron and Steel Electrical Engineers, at Pittsburgh, by Stewart C. Coey, assistant mechanical and electrical engineer, Youngstown Sheet & Tube Co.

more than six candle power per square inch, which is allowed to come within the field of vision, has a detrimental effect on eyesight. As a test of this point I believe the following rule is a safe guide: "Any light source which leaves an after image or causes a blurring effect on the eye when an attempt is made to immediately view some other object after a short glance at the light source, is too bright."

Brilliant Modern Lamps

The intrinsic brilliance of incandescent lamps has been rapidly rising as the lamp efficiency has increased, as is shown in the following table:

	Watts per candle power.	Candle power per sq. in.
Carbon	4.0	300
Carbon	3.5	375
Carbon	3.1	486
G. E. M. Metallic Filament	2.5	625
Tantalum	2.0	750
Tungsten	1.25	875
Tungsten	1.0	1,000
Gas Filled Tungsten	0.6 to 0.9	4,000 to 5,000

I call your attention to this especially on account of the tremendous jump in intrinsic brilliancy from the ordinary tungsten lamp to the gas-filled tungsten. Unless the fact is borne rigidly in mind, eye trouble is going to result from the introduction of this type of incandescent lamp. Of course while it is true that the flaming arc, with an intrinsic brilliancy of 5,000 candle power per square inch, and the magnetite arc, with an intrinsic brilliancy of 4,000 candle power per square inch, would under similar conditions, be equally as bad on the eyes, the tendency to place these lights within the field of vision unprotected by an opaque globe is almost negligible, while the gas-filled lamps can easily be used in any available socket of the proper size.

I have attempted to point out the manner in which physical examination can be used as a safeguard in getting the best type of men. I do not claim that this will eliminate accidents, as we all know that at least 50 per cent of them are a result of carelessness or lack of proper knowledge. This type of accident can only be prevented by getting the men themselves interested in safety from a personal standpoint. However, if we cover the points as outlined, and especially as regards organic heart disease some serious injuries and fatalities can be avoided.

When periodical examinations of all employes are made in iron and steel plants, the records obtained will show whether the eyesight of employes in general is being impaired by the light under which they are working. This will make it necessary for the men in charge of the installation of lighting systems, to watch these records closely and adapt the conditions of illumination accordingly.

Foundry Trade

Rather Slow in Making Progress, Said Mr. Hooper

Absence of a sub-division of labor in the average foundry plant, tends to restrain its efficient productiveness, according to G. K. Hooper, of the Hooper Falkenau Engineering Co., of New York City, who presented an address upon the topic, "The Design of the Modern Foundry", at the regular meeting of the Newark Foundrymen's Association, held at the Washington restaurant, Newark, N. J., recently.

"In the early days of the foundry business, so little information was available concerning its fundamental sciences of metallurgy, practical geology and the hydrodynamics of molten metal, that skill in an operative was largely a matter of intuition or genius," said Mr. Hooper. "The trade, therefore, being built upon this, has not adapted itself as freely as possible to the sub-division of labor and use of mechanical appliances as have other trades and the productiveness of the labor in it has not advanced as rapidly and is, I think, lower than in other mechanical trades. The processes also under this condition have a tendency to be wasteful in time and space.

"In the foundry where no sub-division of labor is used, this productiveness averages, according to studies which I have made, from 50 to 60 per cent. With sub-division of labor and the use of mechanical appliances and power, it rises to about 75 per cent.

"With well-arranged machine tools in the machinist trade, we are advised that the productivity of the labor has risen as high as 80 per cent, and on some classes of work to a higher figure."

Mr. Hooper then went on to describe the various modern methods in plant equipment and design, whereby a proper division of operations could be attained. In this portion of his address he described both the inside and outside arrangements. In conclusion he said:

"The figure of 75 per cent is in my belief about the limit which can be reached in the foundry art with such operations as are necessary at this time. There may be, of course, individual instances which will exceed this, but the figure refers to the average. It may be that we shall find in the permanent mold a method which will considerably increase the relative productivity of the labor. Time studies on repetition work to which the permanent mold would be applicable show that there are many times as much labor consumed in making the present mold by present methods as is used in pouring and shaking out, while the material handled in the making of molds is frequently tenfold or more the weight of the castings produced. Also, there are several pieces of equipment to be handled to one casting or gate of castings. If the permanent mold could be developed, these ratios would be cut down and less material and recently.

Higher Tariff

On Imports Into Canada—Special War Taxes Imposed

Hon. W. T. White, Canadian finance minister, in his annual financial statement, announced an all-round increase of the tariff together with the imposition of special war taxes. With a small list of exceptions, the general tariff on imports is raised 7½ per cent and the British preferential tariff 5 per cent. The list of exceptions on which the tariff remains as before includes mowers, binders, harvesters, reapers and traction ditching machines (other agricultural implements being subject to the increase) type setting and type casting machines, surgical and dental instruments, material for ships and anthracite coal. A specific duty of 8 cents per ton general, and 6 cents per ton under the preferential tariff, is imposed upon iron ore.

Special war taxes are imposed on banks, insurance, railway and telegraph companies, a stamp tax of 2 cents on all commercial paper such as checks, bills of lading, etc., and all letters and post cards must bear 1 cent war stamp in addition to ordinary postage.

The changes in the tariff went into force on announcement.

The East Jersey Pipe Corporation of New York City has been chartered at Dover, Del., with a capital of $1,000,000, to manufacture pipes, boilers, stacks, tanks from steel, iron ore other metals, and to deal in stone or earth products. The incorporators are: J. P. Gillespie, president of the East Jersey Pipe Co., 50 Church street, New York, which now is building a large plant at Paterson, N. J., to replace a plant destroyed by fire some time ago; R. A. Johnstone, treasurer of the T. A. Gillespie Co., an affiliated interest, and W. J. Maloney, of Wilmington, Del.

Bessie Furnace

Has Been Rebuilt—Product to be Sold by Allen S. Davison Co.

The Bessie Ferro-Silicon Co., New Straitsville, O., has been reorganized, and is now known as the Bessie Furnace Co., with general offices at 8 East Broad street, Columbus, O. The Bessie furnace, which went out of blast five years ago, has been rebuilt completely. The height of the stack has been increased to 75 feet, three new stoves have been erected, new blowing engines have been installed and modern ore bins and an ore trestle have been built. The furnace, which was blown in Feb. 9, has a capacity of 70 tons a day. Officers of the company are: President and treasurer, N. L. C. Kachelmacher; vice president and secretary, W. R. Pomerene.

The output of the furnace will be handled by the Allen S. Davison Co., 2512 Oliver building, Pittsburgh, dealer in raw materials for iron and steel. The furnace makes 10 to 13 per cent ferro-silicon, guaranteed 0.1 per cent or under in phosphorus and 0.05 per cent or under in sulphur. Material is being sold on the following schedule: 9 to 10 per cent, $18; 10 to 11 per cent, $19; 11 to 12 per cent, $20, and 12 to 13 per cent, $21, f. o. b. furnace, New Straitsville. The Davison company was organized about a year ago with the following officers:

President, Geo. S. Davison; secretary, Albert P. Meyer; treasurer, Allen S. Davison.

Carborundum Exhibit

In the machinery building at the Panama-Pacific Exposition, which opens at San Francisco on Feb. 20, the Carborundum Co., Niagara Falls, N. Y., has an exhibit space occupying an area of 1,400 square feet. The main portion of the setting for the exhibit consists of a classic colonnade with wings. The cornice work is enriched with Greek cresting and moldings and is supported by fluted columns with ornamental capitals. The wings of the colonnade form partly enclosed office spaces.

In the center of the exhibit space is a fountain with a tile basin and marble curbing. The fountain is built of irregular masses of vario-colored, iridescent carborundum crystals, piled to a height of about 10 feet. Over this mass of crystals water plays, giving a most startling effect. The floor of the exhibit space is laid with finished plaquettes of carborundum and aloxite and the four aisles leading to the fountain are floored in a Greek pattern with plaquettes of white composition, inlaid with carborundum and aloxite. Around the fountain are grouped marble urns which have been molded with carborundum wheels.

From manufacturing plants all over the world have been gathered materials which are ground, shaped or finished with carborundum products. Nearly 400 of these exhibits are shown and each contains a short description of the article and of the work done on it with carborundum products. A partial list of the articles shown, in the production of which carborundum products in some form or another have played an important part, include crank-shafts, automobile parts, tools, various woods sanded with carborundum, garnet paper and cloths, aluminum, gray iron, brass and bronze castings, car wheels, saws, aluminum cooking utensils, shrapnel shells, locomotive parts, drills, reamers and almost every conceivable article made from metal.

Dismissed

Was Jury in Case Against Carbon Steel Co. Employes

After deliberating for about 12 hours, the jury selected to decide evidence in the case against Simeon M. Wetmore, Dennis K. Bullens, Henry Lutz and David J. Simpson, all former officers or employes of the Carbon Steel Co., Pittsburgh, announced that no agreement could be reached and the jurymen were dismissed.

The former Carbon Co. men were indicted last May in the federal court of western Pennsylvania, charged with conspiracy to defraud the government in the manufacture of steel material for Panama canal work. Their attorneys declared the whole case was based upon suspicion, and contended evidence submitted by the prosecution was not sufficient to indicate guilt.

Whether a new trial will be asked, or whether indictments will be nolled, is unknown. The case was heard before Judge W. H. S. Thomson, at Pittsburgh.

Edward Ehlers, of the Rockaway Rolling Mill Co., Rockaway, N. J., has sold to other manufacturing interests a factory building and plot of ground, 72 x 92 feet, at 732 to 736 East Eleventh street, Greenpoint, Brooklyn.

The West Penn Steel Co., Brackenridge, Pa., has opened a Detroit office, 514 Dime Bank building, with George R. Fink, manager. The eastern half of Michigan will be covered from this office.

Nickel Exports

Bill in Canadian Parliament Would Prohibit Them

Toronto, Feb. 16.—An active agitation has been carried on for some time for the absolute prohibition of exports of nickel in any form outside of the British Empire in order to prevent the Germans obtaining supplies of the Canadian product. Hitherto the Canadian government has refused to resort to so drastic a measure, as the British authorities profess themselves satisfied with the precautions taken by the International Nickel Co., which refines the nickel-matte in New Jersey, to prevent any shipments from reaching Germany. Nevertheless the movement, though ignored by the leading newspapers of both parties, appears to be making headway, and a large number of petitions for the prohibition of nickel exports have been presented to the Canadian Parliament. W. F. Maclean, M. P. for South York, one of the principal leaders in the agitation, has given notice of the introduction of a bill entirely prohibiting the exportation to foreign countries of nickel ore, nickel matte, nickel oxide and all compounds of nickel during the present or any future war in which the British Empire may be engaged, and also providing that the export in times of peace shall be subject to regulations made by the government, under which authority they might easily compel the producers to refine all nickel in Canada.

While this measure, which will come up at an early date, may cause an exciting debate, it is not likely to carry, owing to the strength of party discipline. The government has so far taken the ground that the more suspicion that a small quantity of the Canadian nickel output may possibly reach Germany by a circuitous route is not a sufficient reason to stop the exportation of nickel-matte and thereby paralyze for the time being the important nickel-mining industry. The government is likely to be confirmed in maintaining this ground by the attitude of the opposition, which has so far shown no disposition to make capital out of the agitation.

Another phase of the question which is receiving more support from substantial business interests and may ultimately meet with success, is the movement to have all nickel refined in Canada in place of exporting the nickel-matte to American refineries. Resolutions favoring this proposition have been passed by a number of boards of trade and the Provincial government of Ontario is disposed to regard it favorably.

Are They Common Carriers?

Washington, Feb. 16.—Arguments were made before the interstate commerce commission last Friday and Saturday by representatives of short and trunk line railroads in which the former were opposed in their claims that they are common carriers and therefore entitled to receive rate allowances from the trunk lines. There were 31 short lines involved in the proceeding, protesting against cancellation of joint rates and through routes as provided in tariffs filed last April by the trunk lines. The trunk lines based their action on the first decision of the commission in the Industrial Railways' case, which dealt exclusively with steel company roads. None of the 31 short lines was a party to that case, but the character of the services performed by them and the lines involved in the Industrial Railways' case is similar as a general thing. The cancellation tariffs are under suspension.

Appearing for the Essex Terminal, operating in Canada, and for the Johnstown & Stoney Creek railroad, was C. S. Belsterling, commerce counsel for the United States Steel Corporation; I. P. Blanton represented the Marting Iron & Steel Co., the Newcastle & Ohio River and the Hanging Rock Iron Co. roads, and Attorney W. A. Glasgow the Chesnut Ridge road, operated by the New Jersey Zinc Co. George Stuart Patterson, appearing for the Pennsylvania, Baltimore & Ohio and New York Central, made the principal argument for the trunk lines.

Lorain is More Cheerful

The city of Lorain, O., which has suffered severely from the depression of the past year, is feeling somewhat more cheerful on account of a gradual increase in activities at the plants of the National Tube Co. and other companies. The rail mill of the National Tube Co. was started Feb. 15 after a long period of inactivity and the blooming mills and converting mills are on double turn.

The Brunk Machine & Forging Co., Lorain, has decided to build an addition at the cost of $10,000. It will be of brick, three stories.

Safety Medals Awarded. — Annual award of medals for the best records in promoting safety work was made by the American Museum of Safety at New York City, at its meeting last week. *The Scientific American* safety medal went to the Shur-Lock Elevator Safety Co., Inc.; the Travelers' Insurance Co. medal to the Commonwealth-Edison Co. of Chicago; the A. N. Brady memorial safety medals to the Boston Elevated Co. and the E. L. Harriman memorial gold medal to the New York Central Railroad. The Rathenau medal, founded by Amil Rathenau, the German scientist, was suspended this year, on account of the war.

Case Reopened

Washington, Feb. 16.—Acting upon the supplemental petition filed recently on behalf of Virginia pig iron makers, the interstate commerce commission has entered an order reopening the case involving freight rates from Virginia furnaces to points throughout the New England states, Pennsylvania, New Jersey, New York, Ohio and Quebec. Previous orders are to continue in force. No date for further hearing was set.

Will Merge Cement Companies

Chicago, Feb. 16.—Edward M. Hagar, who recently resigned as president of the Universal Portland Cement Co., one of the subsidiaries of the United States Steel Corporation, has opened office at 1376 Continental & Commercial National Bank building, Chicago. Mr. Hagar is engaged in forming a corporation to take over a chain of portland cement companies extending across the country. It has not yet been determined what name they will be merged under nor what plans will be involved. It is stated that the resulting corporation will be large and will represent a great portion of the independent makers of portland cement. Mr. Hagar's ability as an executive has been proven by the growth of the Universal Portland Cement Co., which has increased its output to 12,000,000 barrels per year since it started in business in May, 1900.

Further developments of the corporation are awaited with interest by the cement trade.

Property of the Illinois Iron & Metal Co., Chicago, was sold at auction recently, I. Star, of Chicago, taking the property for about $25,000. It is understood he bought for M. Singer, formerly of the Illinois Iron & Metal Co., who holds the lease on the yard.

Contract for Coke Plant. — The Lackawanna Steel Co., having decided to build a benzol plant in connection with their by-product coke ovens at Lackawanna, New York, has awarded the contract for erection of the plant to the Otto Coking Co., Inc., 6 Church street, New York, and work has started on the plant. It is the intention to have the plant completed and in operation inside of five or six months.

Death of Wm. Edgar Allen

Birmingham, Eng., Feb. 8.—The death has taken place recently of William Edgar Allen, widely known as the founder of Edgar Allen & Co., the Imperial Steel Works. Mr. Allen commenced as a steel and file manufacturer and merchant, and founded the firm in 1868. In cultivating the continental trade his thorough knowledge of many languages was of the greatest assistance. He had heavy transactions in railway material with the continent and also with South America. On the development into a limited company, the firm specialized on steel castings and especially on manganese tramway points and crossings, railway buffers, saws for cutting armor plates and high speed steel. He was a great benefactor to Sheffield and gave large sums to the support of various educational institutions, especially in connection with the promotion of the sciences connected with iron and steel.

Obituaries

John E. Hall, 78, a steel rule maker, and the oldest employe in point of service of the Browne & Sharpe Mfg. Co., Providence, R. I., died at his home in that city recently. He was born in Bangor, Me., in 1836, and had worked for Browne & Sharpe since 1868. He operated the same machine for 54 years, it being known as a graduating machine for rules and squares.

George E. McEvoy, district manager of the Pittsburgh Testing Laboratories at Cincinnati, O., died recently. He was a native of Milwaukee, 38 years old, a graduate of the University of Wisconsin, and before going to Cincinnati was connected with the Bay View Works of the Illinois Steel Co. in Milwaukee for several years.

Foreign shipments of motor trucks aggregating in value more than $700,000 have been made by the Kissel Motor Car Co., Hartford, Wis. Advices received by the company from abroad and from American agents of European governments indicate that even greater business will soon be placed and that Kissel-Kar trucks will be specified in a large portion of it.

Business News from the Capital

Manufacturers Between Pittsburgh and Missouri River Placed on Parity With Eastern Competitors for Pacific Coast Business

Washington, Feb. 16.—Iron and steel manufacturers whose plants are situated between Pittsburgh and the Missouri river have been placed upon a parity with competitors at or near the Atlantic seaboard in seeking the Pacific coast markets. By its supplemental decision last Thursday in the intermountain case, the interstate commerce commission gave a broad recognition of the fact that "we are witnessing the beginning of a new era in transportation between the Atlantic and Pacific coasts", and in large part granted the relief sought by the railroads. They have been allowed by the decision to charge more for intermediate hauls than for carrying traffic all the way to the Pacific coast. Opening of the Panama canal, resulting in depressed rates by water lines, was held by the commission to justify its construction of the long-and-short-haul provision. The iron and steel industry perhaps more than any other individual enterprise is the most greatly affected by the opinion.

It was maintained by middle west makers of iron and steel that unless the remedy which has been adopted was granted them, competitors at or near the Atlantic coast would control the Pacific markets entirely by reason of the lower rates they would obtain.

Under the original order, carriers were required from the Missouri river westward not to charge more to an intermountain point than to a Pacific terminal. East of the river the stringency was somewhat abated. From Chicago to intermountain points the excess charge permitted over the rate to the Pacific terminals was 7 per cent; from Pittsburgh, 15 per cent; from the Atlantic seaboard, 25 per cent.

Additional relief was sought by railroads and manufacturers, many of them iron and steel makers of the middle west, who were dissatisfied with the first finding as outlined in their rates, incorporated in schedule C. Most of the relief has been granted by the supplemental decision. The relief sought pertained to about 100 carload commodity items and about 50 less-than-carload items. These carload rates to the Pacific, which have been allowed, range from 55 to 95 cents per 100 pounds, and the less-than-carload commodity rates range from $1.10 to $1.75 per 100 pounds. Included in these are most all kinds of iron and steel articles, and other commodities which originate in large volume at or near the Atlantic seaboard, are particularly adapted to water transportation.

As against the previous finding, the commission approved the following:

On about 25 items which move in carloads from the Missouri river to the Pacific coast at rates of less than 75 cents per 100 pounds, carriers are permitted to establish rates proposed to the California terminals and to continue rates to intermediate points not higher than 75 cents per 100 pounds. On all other traffic, rates from the Missouri river to the Pacific coast must be carried as maxima at intermediate points.

From Chicago, Buffalo and New York, carriers are permitted to carry carload rates to intermediate points 15, 25 and 35 cents, respectively, higher than from the Missouri river to the same destinations.

Less-than-carload commodity rates on articles classified as first or second class in western classification which are less than $1.50 per 100 pounds from the Missouri river to the Pacific coast may be exceeded at intermediate points, but the rates on such articles to such intermediate points must not exceed $1.50 per 100 pounds.

Less-than-carload commodity rates on articles classified as third class or lower in western classification which are less than $1.25 per 100 pounds from the Missouri river to the Pacific coast may be exceeded at intermediate points, but the rates on such articles to such intermediate points must not exceed $1.25 per 100 pounds.

Less-than-carload commodity rates from Chicago, Pittsburgh and New York to intermediate points may exceed the rates from the Missouri river to the same destinations by 25, 40 and 55 cents, respectively.

Carload rates on coal and pig iron may be less to the Pacific coast than to intermediate points, but the rates on such articles to the high-rated intermediate points must not exceed 5 mills per ton-mile.

A suggestion is made that rates to intermediate points near the Pacific coast terminals may be made by adding to the rates to the terminals something less than the locals from terminals to destinations, or by making basing rates to the terminals less than the local rates to such points, to be used in connection with the local rates from the terminals to destinations in making through rates from eastern points to points intermediate to the terminals.

In observence of this order, to become operative May 1, rates on iron and steel articles to Pacific terminals will apply only to San Diego, Wilmington, East Wilmington, San Pedro, San Francisco and Oakland, Cal.; Portland, Ore.; Tacoma and Seattle, Wash.

Significance of Intermountain Case Decision

Representative of the iron and steel articles involved in the supplemental decision in the intermountain case are the following, with the less-than-carload and carload rates in cents per 100 pounds, published by the water lines prior to and subsequent to the opening of the Panama canal, and the proposed rates of the rail lines from transcontinental territories to Pacific terminals:

	Quoted sea rate prior to opening of canal.		Quoted by sea routes Sept. 5, 1914.		Present rail rate.		Proposed rail rate.	
	L. C.	L.	C. L.	L.	C. L.	L.	C. L.	L.
Hardware and tools	100	100	100	100	160–190	125	150	.....
Iron and steel articles	75–85	45–60	75–85	30–60	.....	80	...	*55–80
Crowbars, chains, etc.	85	55	75–85	40–55	125–135	85	125	75
Wire, insulated	100	50	.....	.....	.....	110	...	75
Wire fencing	85–90	50–65	.....	30–40	175	90	125	75

*The 55-cent rate will not apply from Atlantic seaboard. The 80-cent rate will continue to apply on the latter.

Iron and steel articles as used here relate to fabricated and unfabricated material, consisting of angle bars, with head, eye or screw threads; beams, braces, bridge railing, channels, circular frames, columns, floor plates (corrugated), girders, joint hangers, piling, plate (No. 11 or heavier), punched or unpunched, bent or not bent, posts, caps and bases, pulleys (tank or reservoir), rails, riveted, and cast shoes, rivets (not less than ½ inch in diameter), rods, with head, eye or screw threads, sidewalk and floor plates (without glass), truss bars, trusses, tees, tubing, pier, turnbuckles, washers, weights, zees.

Eastern Machinery Trade Active

Export Orders Keep Cincinnati Manufacturers Hustling—Business Lags in Pittsburgh and Chicago Districts

THE WEEK just past, according to reports from almost all quarters, was the most active and prosperous one which the machine tool market in the east has witnessed since the outbreak of the war in Europe. There was a lack of spectacular deals, but orders were placed right and left, involving from one to 25 or 30 tools each, so a large volume of business in the aggregate was entered. In addition there is a large amount of new business pending due to inquiries received this week. Most of this business was due to the war, large export orders having been received from the belligerent countries in Europe, and large orders also coming from concerns here which have booked war orders. Incidentally, manufacturers now are figuring on a lot of new contracts for war materials which, if placed, will still further stimulate the machinery market. In addition to these war orders, there was an improved volume of inquiry and buying during the week which had no connection at all with the war, thus indicating, according to some machinery people, an improvement in underlying conditions. One of the features of the week was the awarding of a contract for 13 additional cranes by the Bethlehem Steel Co., to the Pawling & Harnischfeger Co., Milwaukee. The latter company thus has taken all the cranes, 17 in number, for the Bethlehem company's bridge shop extension. The Ford & Kendig Co., Philadelphia, is taking prices on a 10-ton crane, and the Robbins Dry Dock & Repair Co., Erie Basin, Brooklyn, N. Y., on a 20-ton crane. The Maryland Steel Co., which is increasing its ship building capacity, is taking prices on a large gantry crane. The Fore River Ship Building Co., Quincy, Mass., has purchased two additional cranes. Only a few additional inquiries are noted from the railroads; the Norfolk & Western is in the market for a lathe and the New York Central for a driving wheel lathe. The Groton Bridge Co., Groton, N. J., inquires for 75 turret lathes and screw cutting machines for making shells.

Despite continued moderate improvement in the general machinery market, Pittsburgh dealers are not satisfied with the situation in western Pennsylvania and eastern Ohio. The railroads are taking no part in the market and the more important steel producing concerns are not buying more than 35 per cent of normal requirements. Second-hand machines continue to be installed wherever possible, and keen competition among manufacturers and sellers has developed low prices. The Youngstown Iron & Steel Co., Youngstown, O., which is building a new open-hearth steel plant, will ask bids shortly on rolling mill and motor equipment.

Sellers of machine tools in Chicago still are awaiting an increased demand for their goods. Some report a slight quickening in inquiry with occasional sales, but as a whole the situation is not changed from the position it has occupied for many weeks. Some second hand machinery has been bought but sales are difficult to make and usually are deferred long after the inquiry has been met. Manufacturers of machine tools in Chicago and its vicinity have felt the uplift of the foreign demand and many are busy turning out goods for export, either on original demands or on contracts turned over by other makers who cannot make delivery at as early a date as the buyers demand.

In Cincinnati, manufacturers of lathes are receiving large orders daily from the nations at war. The demand, instead of falling off as predicted, is increasing. Some plants during the past week have taken orders averaging from 50 to 100 lathes a day. Other manufacturers are refusing to book further ahead, being supplied with contracts that will keep all departments running full for several months. It is undoubtedly the busiest season ever experienced by the machine tool trade in that district and production is being pushed, as manufacturers realize that a dull period probably will follow the close of the war.

EASTERN STATES

BOSTON.—Aberthau Construction Co. has the general contract for the Winchester Repeating Arms Co.'s five-story, 53 x 145-foot building to be used for the manufacture of machinery and light guns.

LYNN, MASS.—Campbell Electric Co. plans to add two stories to its plant shortly.

SALEM, MASS. — Architects Haven & Crosbey, 40 Central street, Boston, are taking revised bids on a four-story and basement, 35 x 213-foot factory, to be erected here for Wm. H. Gove.

SOUTHBRIDGE, MASS.—Dupaul-Lockhart Co. will be incorporated before March 1 for $150,000 and will commence about April 1 erecting a building on Worcester street for the manufacture of lenses.

BRIDGEPORT, CONN.—Remington Arms-Union Metallic Cartridge Co. has started work on one-story, 64 x 65-foot addition; Jas. Stewart, Inc., 30 Church street, New York, is the engineer and builder.

BRISTOL, CONN. — Wallace Barnes Co., manufacturer of springs, is building a one-story, brick rolling mill.

DANIELSON, CONN.—It is stated the Quinebaug Co. has asked permission to increase its capital from $500,000 to $750,000 to provide for installation of new machinery and other improvements.

BROOKLYN. — J. S. Klinger, 443 First street, will erect a $4,000, one-story, 30 x 90-foot machine shop.

BROOKLYN.—Robbins Dry Dock & Repair Co., Erie basin, is in the market for a 20-ton crane.

BROOKLYN. — Hudson Steam Hoisting Corporation, loading and discharging machinery for vessels, has received its charter; $25,000 capital stock; D. Pace, P. Abbate, F. Marra, 237 President street, Brooklyn, incorporators.

BUFFALO.—Condron Co., engineers, Chicago, are preparing plans for an assembly plant for the Ford Motor Co., 200 x 450 feet, four stories and basement, to cost $400,000.

BUFFALO.—Buffalo Meter Co. is to erect a reinforced concrete building, five stories, 80 x 200 feet for a machine shop and brass foundry. Lockwood Green Co., Boston, Mass., are architects.

EASTWOOD, N. Y. — Pierce, Butler & Pierce, Syracuse, have awarded a contract to the Taylor Hornby Construction Co., Syracuse, for a two-story pattern shop, foundry and warehouse, 40 x 68 feet.

MOUNT VERNON, N. Y.—Architect S. A. Guttenberg, Proctor building, is revising plans for two-story, 40 x 110-foot addition for Benford Mfg. Co., spark plug manufacturers, Mount Vernon.

NEW YORK.—New York Central is in the market for a car wheel lathe.

NEW YORK.—Evans Engine Co., pumps, machinery, appliances, has been incorporated; $5,000 capital stock; by J. M. Evans, R. Kirby, H. W. Ward, 17 Battery Place.

NEW YORK.—Cullen-Chambre Construction Co. has been incorporated; $50,000 capital stock; by E. Maury, F. F. Chambre, J. H. Cullen Jr., 1 Broadway.

NEW YORK. — J. H. Claussen Copper Works, machinery, utensils, fixtures, has been incorporated; $10,000 capital stock; by Frank H. Wasel, Ernst Eklenner, Julius H. Claussen, 15 Howard Place, Brooklyn.

NEW YORK.—John Clark Udall Jr., Inc., contractor, builder, manufacturer, implements, utensils, has been incorporated; $100,000 capital stock; by F. H. Bishop, J. A. Udall Jr., J. C. Udall, 305 West Seventy-second street.

NEW YORK.—Four Hundred and Sixty-one Eighth Avenue Co., engineering, construction, machinery, etc., has been incorporated; $10,-

An Unusually Severe Test!

AYER & LORD INTERIOR WOOD BLOCK FLOORING, installed in the plant of the LAKESIDE MALLEABLE CASTINGS COMPANY, RACINE, WIS., is daily given an opportunity of showing up strongly MANY OF ITS SUPERIOR QUALITIES.

Upon this flooring, which comes to within about two feet of the furnaces, the pots are built up, filled with castings, and put into the furnaces. Upon being removed from the furnaces they are dumped on the floor HOT—BUT THE FLOOR DOES NOT CHAR.

Besides this severe treatment, as can be seen in the illustration, these Ayer & Lord Interior Wood Blocks are subjected to the continual strain caused by heavy three-wheeled charging buggies.

SUCH SERVICE CANNOT BE DENIED!

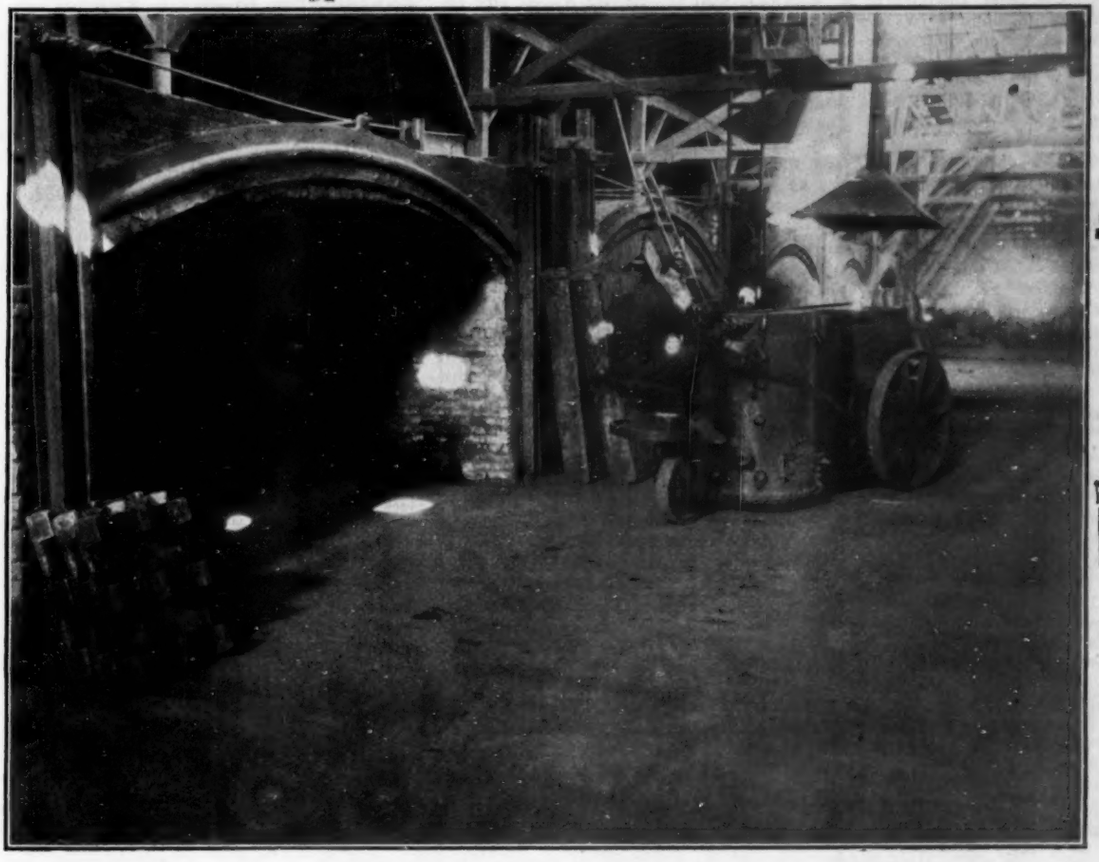
Another User Writes:

"The floor we have installed has given us very good satisfaction. In fact, around our plant we have never had any flooring of any kind that has stood trucking so well."

Ayer & Lord Tie Company

General Offices, Railway Exchange, Chicago

CLEVELAND, OHIO—801 Swetland Building
KANSAS CITY, MO.—1117 Rialto Building
MEMPHIS, TENN.—1402 Exchange Building
PHILADELPHIA, PA.—319 Perry Building



AYER & LORD INTERIOR — Always Easy on the Feet — WOOD BLOCKS

000 capital stock; by W. J. Hughs, A. T. and M. Campbell, 302 West 106th street.

OZONE PARK, L. I., N. Y.—New York Municipal Railway Corporation has taken bids on a two-story, 38 x 85-foot sub-station, to be erected here on Rockaway Beach Line.

SYRACUSE, N. Y.—H. E. Hessler Co., 512 North Salina street, will erect a two story, 32 x 90-foot addition, on which Taber & Baxter, architects, are taking revised bids.

TUCKAHOE, N. Y.—Hodgman Rubber Co., 806 Broadway, New York, have plans in progress by Architect W. L. Stoddart, 9 East Fortieth street, New York, for four-story, 50 x 150-foot plant to be erected at Tuckahoe.

ALTOONA, PA.—Pennsylvania railroad is considering electrifying certain sections of the road in the mountains; project will involve power stations and transmission lines.

ERIE, PA.—Penn Electric Mfg. Co. will build a $75,000 steel and brick factory near the site of the plant destroyed by fire last December; additional equipment will be purchased.

HARRISBURG, PA.—Thomas B. Kennedy, Chambersburg, Pa., engineer in charge for the Cumberland Valley Railway, is preparing plans for a double track railway bridge over the Susquehanna river, consisting of 45 concrete arches about 7 feet wide and one 70-foot steel half through plate girder, to cost $750,000.

JOHNSTONE, PA.—Thomas A. Edison, as previously announced, will erect a benzol recovery plant, as result of negotiations closed with the Cambria Steel Co.

LANCASTER, PA.—Buch Foundry Equipment Co. has increased its capital stock from $5,000 to $175,000; J. Harvey Buch is identified with the company.

MERCER, PA.—Renzor Mfg. Co., manufacturer of stoves, will erect a $175,000, 60 x 260-foot, four-story addition; Edsal Barr, architect, Erie, Pa., is preparing the plans; bids will be taken within 60 days.

PHILADELPHIA. — Belmont Iron Works has contract for erecting additions, 54 x 109 feet and 17 x 25 feet and a crane runway for the Ford & Kendig Co. at the northwest corner of Twenty-fourth and Wood streets.

PITTSBURGH.—Pittsburgh Sand & Supply Co. is asking for bids on a revolving pillar crane.

PITTSBURGH.—Bids are being taken for a three-story and basement experimental station to be erected here by the United States bureau of mines. The building will be 60 x 239 feet, with two wings, each 47 x 211 feet.

PITTSBURGH.—About 1,000 tons of structural steel will be required by the Logan-Gregg Hardware Co., who will erect a building especially designed for the jobbing hardware business on Ninth street.

PITTSBURGH.—Huehl, Schmid & Holmes, 154 West Randolph street, Chicago, are drawing plans for a Shrine temple, three stories and basement 130 x 206 feet, to cost $500,000; the Westcott Engineering Co., 10 South La Salle street, Chicago, is engineer.

PITTSTON, PA.—North Branch Engineering Co. has been incorporated; $10,000 capital stock; H. B. Bouton, treasurer.

SHAMOKIN, PA.—Plans are being made for a bridge across the Susquehanna river, between Herndon and Port Trevorton, Snyder county, to cost about $250,000.

SHARON, PA.—Mercer county commissioners will erect a 175-foot bridge, with steel superstructure; L. E. Burnside, engineer, Grove City, Pa., has completed the plans.

WASHINGTON, PA.—Three-story Masonic Temple, 50 x 175 feet, will be erected in Washington; J. W. Vester, architect, is preparing plans.

WILLIAMSPORT, PA.—Lycoming Foundry & Machine Co. expects to increase the capacity of its foundry and machine shop and is inquiring for several molding machines, including core machines of the roll-over type; the company also is in the market for miscellaneous machine shop equipment.

BRIDGETON, N. J.—Sanitary Can Co. will erect a 60 x 160-foot, concrete addition to its plant.

CAMDEN, N. J.—Wm. Steele & Sons Co., Philadelphia, have taken sub-bids for one and one-half-story addition, 45 x 82 feet, for Jos. Campbell Co., 32 North Front street, Camden.

CAMDEN, N. J.—Philadelphia & Camden Bridge & Terminal Co. has been incorporated; $125,000 capital stock; by J. Disbrow Baker, Joseph P. Murray, F. Stanley Saurman, all of Camden; its purpose is to secure contract for proposed John Woolman Memorial bridge across the Delaware river from Burlington, N. J., to Bristol, Pa.; New Jersey legislature has provided for its erection and Governor Fielder has appointed a commission to prepare plans.

NEW BRUNSWICK, N. J.—Common council will build a $175,000 high school.

TRENTON, N. J.—Mercer Gas & Electric Fixture Co. has been forced to close its factory and will dispose of goods at public sale.

CANTON, MD.—Turner Construction Co., 11 Broadway, New York, has contract for erecting two-story, 50 x 200-foot mechanical plant at Canton for Standard Oil Co., Baltimore division.

WASHINGTON.—Department of commerce has put out a list of some six tools on which prices are to be taken for Salmon & Co., Paris.

WASHINGTON.—An extension has been made by the bureau of yards and docks of the navy department from Feb. 13 to Feb. 27, for receiving bids on a 150-ton floating revolving crane for the navy yard at Norfolk, Va., to cost $450,000.

CENTRAL STATES

BARBERTON, O.—H. W. Alcorn, city engineer, will have plans completed March 1 for the proposed East Tuscarawas avenue bridge.

BRYAN, O.—W. H. Davis, county engineer, says plans will be ready this month for the 144-foot steel, Schluker bridge; the 60-foot, steel Ager bridge; the Haughn bridge and Elder bridge, both steel spans.

CANAL DOVER, O.—Reeves Bros. Co., steel sheet manufacturer, has awarded contracts for additions to the boiler plant to the Heine company, St. Louis.

CINCINNATI.—Bids will be received at the United States Engineer's office, 405 Custom House, until March 2 for two steel fuel floats, and one steel barge.

CINCINNATI.—A small amount of light equipment will be required by L. B. Reakirt, who will erect a large garage at Fifth and Sycamore streets.

CINCINNATI.—Charles H. Behlen Sons Co. will erect a large addition to its garage on Rockdale avenue; light equipment probably will be required.

CINCINNATI.—Gruen Watch Case Co. will erect a plant on Millan street, near Reading road; date for starting operations not decided upon.

CINCINNATI.—Van Bibber Roller Co.'s plant damaged by fire causing a loss of $25,000 to machinery and manufactured stock and about $50,000 to the building; company manufactures printer's rollers.

CINCINNATI.—An architect will be selected shortly to prepare preliminary plans for the proposed high school building, to cost about $1,000,000 at Madison road and Erie avenue.

CINCINNATI.—Numattic Co. has been incorporated with a capital stock of $15,000 to manufacture automobile accessories; a plant will be secured shortly; most of the equipment has been purchased. Among the incorporators are P. W. Weber, Fred S. Richards and O. H. Foster.

CLEVELAND.—Iceless Machine Co. has increased its capital stock from $1,000 to $500,000.

CLEVELAND.—Ohio Cast Stone Co. has purchased seven acres at Painesville, which is reported will be a site for a plant.

CLEVELAND.—Cleveland Steel Barrel Co. will build a $5,000, two-story, brick office addition.

CLEVELAND.—Cleveland Railway Co. will start work shortly on the proposed $150,000 car barn and power unit at West Seventy-third street and Denison avenue.

CLEVELAND. — Blanchard Mfg. Co., bed springs and spring beds, has been incorporated; $10,000 capital stock; by B. E. Blanchard, W. T. Stalker, A. C. Green, Clayton H. Warner, H. A. Naftzger.

CLEVELAND.—Commissioner of purchases and supplies will receive bids until noon, Feb. 26 for transformers for the municipal electric light department; also on that date for a high pressure duplex boiler feed pump for the municipal electric light department.

COLUMBUS, O.—An eight story, business building, to be occupied entirely by the Z. L. White Co., will be erected at 108 North High street, work to start this spring.

DAYTON, O.—President Fox of the Fox Typewriter Co., has arranged with Dayton business men that if $150,000 in stock subscriptions can be secured, his factory employing 350 men will be moved to Dayton.

EAST LIVERPOOL, O.—Chester & Fleming, Pittsburgh, engineers, have been awarded the contract for the construction of a mechanical filtration plant in East Liverpool to cost approximately $300,000.

FOSTORIA, O.—Keasey Mfg. Co., pulleys and machinery, has been incorporated; $25,000 capital stock; by Elizabeth B. Keasey, C. D. Sullivan, Michael G. Delaney, John H. O'Leary, T. Gaynor.

FREMONT, O.—W. F. Schepflin, county engineer, will advertise for bids the last of this month for a high truss bridge, consisting of two 166-foot spans.

HAMILTON, O.—W. W. Crawford, county auditor, will open bids March 3 for a bridge across the Great Miami river at Pottstown; certified check 10 per cent required.

MARIETTA, O.—Covey Construction Co. has been incorporated; $5,000 capital stock; by Charles H. Covey, M. W. Athey, C. A. Schletzer, et al.

MILLERSBURG, O.—Holmes Construction Co. has been incorporated; $10,000 capital stock; by W. A., Arthur and Oscar D. Miller, T. J. Schnee, C. J. Fisher.

MT. VERNON, O.—County commissioners have authorized a $20,000 bridge across the Kokosing river, on Gambier street.

CLARKSBURG, W. VA.—All buildings, including gas engines, boilers, elevators and other equipment, at the plant of the Glenview Brick Co. were badly damaged by fire.

FAIRMONT, W. VA.—State board of control will erect normal school buildings and dormitories, to cost $300,000; Architects Seymour & Davis, Sampson street, Philadelphia, have the plans.

HUNTINGTON, W. VA.—A. B. Maupin, city engineer, will advertise for bids soon for two overhead bridges over the C. & O. and B. & O. railroads.

MORGANTOWN, W. VA. — Cole Bros., Inc., Baltimore, will erect a bridge at this center, to cost $65,000.

NEW CUMBERLAND, W. VA.—The plant formerly occupied by the General Porcelain Co., inactive since the company concentrated

its interests in Parkersburg, is to be remodeled and placed in operation by Lee Smith.

GOSHEN, IND.—Company has been formed to manufacture a type-high machine, invented by Ira Howard, formerly of the News Printing Co.; E. A. Dausman, is an incorporator.

INDIANAPOLIS.—Wilbur T. Mills, architect, Columbus, O., will take bids about April 1 for a 10 story hotel to cost $200,000.

INDIANAPOLIS.—Chas. Byfield, 923 Law building, has asked plans for Hugh McK. Landon and will take bids about March 1 for a six-story hotel to cost $200,000, of steel and reinforced concrete.

CHICAGO. — General Porcelain Enameling & Mfg. Co. has been incorporated to manufacture porcelain enameled goods; $10,000 capital stock; Anton Gati, Frank Brazda, Andrew Gallik, 634 Willow street.

CHICAGO.—Burdett Oxygen Co. has been incorporated to manufacture machinery and gas generating apparatus; $100,000 capital stock; by E. J. Luening, Paul Pleiss, J. B. Burdett, 10244 Longwood avenue.

CHICAGO. — Steel Sales Corporation has been incorporated to manufacture iron and other metals; $25,000 capital stock; by A. R. Dorman, F. W. Walters, B. E. McDonald, D. R. Hoffman, 6120 Stony Island avenue.

CHICAGO.—Johnson Variable Speed Gear Co. has been incorporated to manufacture automobile equipment and specialties; $25,000 capital stock; Chas. E. Sullivan, C. Olseon, Clinton A. Johnson, 6921 South Oakley avenue.

LINCOLN, ILL.—Lincoln Railway & Heating Co. has been incorporated; $15,000 capital stock; by J. R. Patton, John A. Hoblit, Frank S. Bevan.

MOOSEHEART, ILL.—Board of governors of the Loyal Order of Moose has appropriated $350,000 for a machine shop, foundry and printing shop and equipment in connection with the orphan asylum at this place; James J. Davis and M. M. Garland, of Pittsburgh and John J. Lentz of Columbus, O., are members of the board.

PEORIA, ILL.—A bridge is to be constructed at South Adam street of steel on concrete pedestals, 25 spans, total length 1,600 feet, to cost $109,000; Hedrick & Cochrane, 118 McGee street, Kansas City, Mo., are consulting engineers.

SPRINGFIELD, ILL. — Capital Planing Mill Co. has been incorporated; $25,000 capital stock; by H. O. McCrue, John York, F. S. Thompson, John L. Tonjes.

SOUTHERN STATES

BRISTOL, VA.—B. Calvert, Spartanburg, S. C., is interested in a cotton mills company, which is being organized with a capital of not less than $500,000, to erect a plant either in Bristol or Johnson City, Tenn.

CHARLOTTESVILLE, VA.—Cheape Adding Machine Co. has been incorporated at $100,000 and will locate a plant in Charlottesville; Thomas S. Keller, president; J. A. Cheape, vice president and general manager; E. W. Hardesty, secretary-treasurer.

NORFOLK, VA.—Norfolk & Western railroad is in the market for a lathe.

HARRISBURG, TEX. — Commissioners court of Harris county, (Houston county seat) has instructed the county engineer to make plans for a steel bridge over the Brays Bayou to replace the present structure at a cost of $15,000.

NASHVILLE, TENN. — Samuel Hanneford & Sons, 700 Hulburt building, Cincinnati, will take bids shortly on a four-story structure 207 x 254 feet, for the college of medicine of the Vanderbilt University. Will be of pressed brick and terra cotta trim, reinforced concrete and structural iron.

"——Still in the Ring"

Since the Ohio legislature, in its biennial struggle with the obnoxious and perfidious anti-tipping bill, has tipped this measure overboard, we will reassure our readers that we are still in the ring, as a glance at the following tips will thoroughly demonstrate.

Groton Bridge Co., Groton, N. J., is inquiring for 75 turret lathes and screw-cutting machines for making shells.

Youngstown Iron & Steel Co., Youngstown, O., which is building an open hearth steel plant, will ask bids shortly on rolling mill and motor equipment.

Preliminary plans for a $1,000,000 high school at Madison road and Erie avenue, Cincinnati, will be prepared shortly.

Robbins Dry Dock & Repair Co., Erie basin, Brooklyn, is in the market for a 20-ton crane.

Pittsburgh Sand & Supply Co., Pittsburgh, is asking bids on a revolving pillar crane.

Board of governors of the Loyal Order of Moose has appropriated $350,000 for a machine shop, foundry and printing shop and equipment in connection with the orphan asylum at Mooseheart, Ill. James J. Davis and M. M. Garland, Pittsburgh, and John J. Lentz, Columbus, O., are board members.

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W. F. Schepflin, county engineer, Fremont, O., will advertise for bids about the last of February for a high truss bridge, consisting of two 166-foot spans.

Department of commerce, Washington, has put out a list of six machine tools on which prices are being taken for Salmon & Co., Paris.

Lycoming Foundry & Machine Co., Williamsport, Pa., expects to increase the capacity of its foundry and machine shop and is inquiring for several molding machines, including core machines of the roll-over type; the company also is in the market for miscellaneous machine shop equipment.

New York Central railroad is in the market for a car wheel lathe.

Hodgman Rubber Co., 806 Broadway, New York City, are having plans drawn up by W. L. Stoddart, architect, 9 East Fortieth street, New York City, for a four-story, 50 x 150- foot plant to be erected at Tuchahoe, N. Y.

M .W. Torkelson, state bridge engineer, Madison, Wis., will prepare plans shortly for a 400-foot steel highway bridge over Black river at Campbell, La Crosse county; construction will be undertaken before summer.

Bids will be taken within 60 days for a $175,000, four story, 60 x 260-foot addition to the plant of the Renzor Mfg. Co., Mercer, Pa., manufacturer of stoves. Edsal Barr, Erie, Pa., is preparing plans.

WESTERN STATES

LAWRENCE, KAN.—H. Broeker, clerk of Douglas County, has preliminary plans for a $200,000 reinforced concrete bridge, 198 feet long, 28 feet roadway, over the Kaw river.

HARDIN, MONT.—James Thorpe Co., Denver, Col., has asked the council for a franchise to erect and conduct a gas plant.

PHOENIX, ARIZ.—G. H. Kahrs will erect a $1,000 brick building for use as a machine shop.

POCATELLO, IDA. — T. A. Ferguson, Butte, Mont., has leased the Fort Hall mining property and is considering the construction of a cyanide plant.

SILVER CITY, IDA.—County commissioners will appropriate $6,000 for a steel bridge across the Snake river, provided the state will appropriate $20,000 to assist the work.

WALLACE, IDA.—Mill of the Interstate-Callahan mine in Wallace will be enlarged.

COLFAX, WASH. — Elberton Milling Co. has requested a franchise for installation of an electric power and light plant at an estimated cost of $180,000.

COPALLIS, WASH.—It is reported the Carlyle-Pennel Lumber Co. will erect a large sawmill in Copallis.

EVERETT, WASH.—Everett Packing Co. is remodeling the old nail works and will install machinery for fish cannery.

FERNDALE, WASH.—McCarthy, Allen & Marshal have purchased the Morrison mill on the Nooksack river, and will overhaul and install new machinery where needed.

MONTESANO, WASH. — Northwest Electric & Waterworks has contracted with the Sunset Shingle Co. to construct a power house at the shingle mill to use waste material; present plant at Sylvia Lake will be enlarged and used as an auxiliary plant.

MORTON, WASH.—Commercial club is negotiating with Harry J. Miller, Seattle, for the construction of a 40,000-foot capacity sawmill in Morton.

RICHFIELD, WASH.—Portland, Ore., office of NePage, McKenny & Co. electrical engineers and contractors, has secured contract for installation of transmission system in Richfield, including poles, overhead wires, street lamps, transformers and motors.

SEATTLE. — Contract for construction of two steel bridges has been awarded to the Coast Bridge Co., Portland, Ore., at $9,427 and $10,907.

SEATTLE.—J. B. Cavanaugh, major of engineers, Burke building, will receive bids until noon, March 15 for pumping plant for Lake Washington canal locks.

SPOKANE, WASH.—Inland Empire Railway Co. will develop a power site at Bowl and Pitcher, five miles down the river.

BANDON, ORE.—Port of Bandon is considering the acquisition of a new dredge to cost about $50,000.

PORTLAND, ORE.—Jacoberger & Smith will prepare plans for the Coin Machine Co. for a two-story, reinforced concrete building, to cost, including equipment, $75,000.

PORTLAND, ORE.—C. B. Hegardt, engineer for the dock commission, will advertise for 42 two-wheel trucks and 12 four-wheel trucks.

TILLAMOOK, ORE.—J. R. Wheeler, electrical engineer, has started erecting a lighting plant at Bar View.

SAN FRANCISCO. — Consolidated Electric Co. has been incorporated to build and operate power houses; $10,000 capital stock; by C. E. Baen, E. K. Spotton, G. Reents.

SAN FRANCISCO.—Delta Mfg. & Supply Co. has been incorporated to manufacture steel products; $10,000 capital stock; by G. M. and J. D. O'Hara, M. T. Towney, C. W. Schwacker.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to April 1.)

Bessemer, valley	$13.60
Bessemer, Pittsburgh	14.55
Basic, Pittsburgh	13.45
Basic, eastern Pa.	14.00
Malleable, Pittsburgh	13.70 to 13.95
Malleable foundry, Chicago	13.00 to 13.50
Malleable foundry, Philadelphia	15.00 to 15.25
Malleable foundry, Buffalo	13.00 to 13.25
No. 1X foundry, Philadelphia	14.50 to 14.75
No. 2 foundry, Pittsburgh	13.95
No. 2 foundry, valley	13.00
No. 2 foundry, Cleveland	13.50
No. 2 foundry, Ironton	12.75 to 13.00
No. 2 foundry, Chicago	13.00 to 13.50
No. 2X foundry, Philadelphia	14.25 to 14.50
No. 2X fdy., N. J. tidewater	14.25 to 14.50
No. 2X foundry, Buffalo	13.00 to 13.25
No. 2 plain, Philadelphia	14.00 to 14.25
No. 2 plain, N. J. tidewater	14.00 to 14.25
No. 2 plain, Buffalo	13.00
No. 2 southern, Birmingham	9.50 to 10.00
No. 2 southern, Cincinnati	12.40 to 12.90
No. 2 southern, Chicago	13.50 to 14.00
No. 2 southern, Phila. delivery	14.00 to 14.50
No. 2 southern, Cleveland	13.50 to 13.75
No. 2 south'n, New York, docks	13.75 to 14.00
No. 2 southern Boston, docks	13.75 to 14.25
No. 2 south'n, interior New Eng.	14.50 to 15.50
No. 2 southern, St. Louis	14.00 to 14.25
Virginia No. 2X furnace	12.50 to 12.75
Virginia 2X, Philadelphia	15.25 to 15.50
Virginia 2X, Jersey City	15.50 to 15.75
Virginia 2X, Boston points	15.75 to 16.00
Gray forge, eastern Pa.	13.25 to 13.50
Gray forge, Pittsburgh	13.45 to 13.70
Gray forge, Birmingham	8.75 to 9.00
Silveries, 8 per cent, Jackson, O.	15.50 to 15.75
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	19.00 to 20.00
Lebanon low phos., furnace	16.00 to 16.50
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	15.75 to 17.00
Charcoal, Birmingham	25.00

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7c to 8c
Foreign non-Bess., 50 to 65 per cent	7c to 8c

COKE

(At the ovens)

Connellsville furnace	$1.55 to 1.65
Connellsville fur. contr	1.65 to 1.75
Connellsville foundry	2.00 to 2.40
Connellsville fdy., contr	2.25 to 2.50
Wise county furnace	1.75 to 2.00
Wise county foundry	2.10 to 2.40
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.00
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro-manganese, Baltimore	$68.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Open-hearth billets, Phila.	$21.40 to 21.90
Forging billets, Phila.	24.40 to 25.40
Forging billets, Pbgh.	24.00 to 24.50

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.45
From Pittsburgh	.61
From Youngstown	.63
From Niles	.63
From Wheeling	.61
From Steubenville	.61
From Johnstown	.595
From Coatesville	.54
From Steelton	.55
From Bethlehem	.525
From Cleveland	.64
From Chicago	.75

Wire rods, Pittsburgh	$25.00
Billets, Pittsburgh	19.50 to 20.50
Billets, Youngstown	18.50 to 19.50
Sheet bars, Pittsburgh	20.00 to 21.00
Sheet bars, Youngstown	19.00 to 20.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8-lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs., Pbg. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo.	1.07c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c
Angle bars, st. sections, Chgo.	1.50c
Spikes, railroad, Pbgh.	1.35c to 1.40c
Spikes, railroad, Chgo.	1.50c
Track bolts, Pbgh.	1.85c
Track bolts, Chgo.	2.00c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.85
New England	2.85
Philadelphia	2.65
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.20
New England (all rail)	2.45
New York and Brooklyn (all rail)	2.45
New York and Brooklyn (by canal)	1.00 to 1.50
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.10c
Structural shapes, Chicago	1.29c
Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.29c
Tank plates, Pittsburgh	1.10c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.26c to 1.31c
Bars, soft steel, Pittsburgh	1.10c
Bars, soft steel, Chicago	1.29c
Bars, soft steel, Philadelphia	1.25c to 1.30c
Bars, soft steel, New York	1.26c to 1.31c
Hoops, carloads, Pittsburgh	1.25c
Hoops, less carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.10c
Shafting, carloads, Pbgh., disc. contract	67 to 68
Shafting, less carl'ds, Pgh., disc.	63
Bar iron, Chicago	1.07½c to 1.10c
Bar iron, Philadelphia	1.12c to 1.22c
Bar iron, New York	1.10c to 1.15c
Bar iron, Cleveland	1.15c
Bar iron, Pittsburgh	1.10c to 1.15c
Hard steel bars, Chicago	1.20c to 1.25c
Smooth finish, mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.80c to 1.85c
No. 28, black, Chicago	1.94c to 1.99c
No. 28, tin mill, black, Pbgh.	1.85c
No. 28, galvanized, Pbgh., nom.	3.00c to 3.25c
No. 28, galvanized, Chgo. (nom.)	3.44c
No. 10, blue, annealed, Pbgh.	1.30c to 1.35c
No. 10, blue, annealed, Phila.	1.50c to 1.55c
Tin plate, 100 lb., coke base	$3.10 to 3.20

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll., and re-anl.	30 cents
Hot roll'd, pickl'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller levelling	10 cents
Patent levelling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open-hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black	Galv.
	Butt-weld.	
Steel, ¾ to 3 inches	80	69½
Iron, ¾ to 2½ inches	70	59
	Lap-weld.	
Steel, 2½ to 6 inches	80	71½

BOILER TUBES

Steel, 3½ to 4½ inches	74
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.55 to 1.60
Wire nails, retailers, Pittsburgh	1.60 to 1.65
Plain wire, jobbers, Pittsburgh	1.35 to 1.40
Plain wire retailers, Pittsburgh	1.40 to 1.45
Galvanized wire, jobbers, Pbgh.	1.75 to 1.80
Galvanized wire, retailers, Pbgh.	1.80 to 1.85
Polished staples, Pbgh.	1.55 to 1.60
Galvanized staples, Pbgh.	1.95 to 2.00
Barb wire, painted, jobbers, Pbgh.	1.55 to 1.60
Barb wire, painted, retailers, Pbgh.	1.60 to 1.65
Barb wire, galv., retailers, Pbgh.	2.00 to 2.05
Barb wire, galv., jobbers, Pbgh.	1.95 to 2.00

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ½ x 6 inches, smaller or shorter, rolled threads, 80 and 20; cut threads 80 and 15; larger or longer, 75 and 15.

Machine bolts with hot pressed nuts ½ x 4 inches, smaller or shorter, rolled, 80 and 25; cut, 80 and 20; larger or longer, 80.

Gimlet and cone point lag or coach screws, 85 and 5.

Hot pressed square, blank or tapped nuts, $6.50 off list; hot pressed hexagon blank or tapped, $7.40 off.

Cold pressed, square, blank or tapped, $6.20 off; hexagon, blank or tapped, ½ inch and larger, $7.50; ⅜-inch and smaller, $8.00.

RIVETS

Structural rivets, Pbgh	1.45c to 1.50c
Structural rivets, Chgo	1.68c
Boiler irvets, Pbgh	1.55c to 1.60c
Boiler rivets, Chgo	1.78c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

COLD ROLLED STRIP STEEL

(Subject to regular extras.)

0.10 to 0.19 Carbon.	Base price Cut to length Hard.	Soft.
1½ inch and wider	2.85	3.10
0.100 and thicker	2.85	3.10
0.050 to 0.099 inc.	2.95	3.20
0.035 to 0.049 inc.	3.10	3.35
0.031 to 0.034 inc.	3.35	3.75
0.025 to 0.030 inc.	3.60	4.00
0.020 to 0.024 inc.	3.80	4.20
0.017 to 0.019 inc.	4.70	5.20
0.015 and 0.016	5.10	5.60
0.013 and 0.014	5.95	6.45
0.012	6.55	7.05
0.011	6.90	7.40
0.010	7.25	7.75
Coils.		
0.100 and thicker	2.75	3.00
0.050 to 0.099 inc.	2.80	3.05
0.035 to 0.049 inc.	2.95	3.20
0.031 to 0.034 inc.	3.10	3.50
0.025 to 0.030 inc.	3.20	3.60
0.020 to 0.024 inc.	3.30	3.70
0.017 to 0.019 inc.	3.60	4.10
0.015 and 0.016	4.00	4.50
0.013 and 0.014	4.70	5.20
0.012	5.05	5.55
0.011	5.40	5.90
0.010	5.75	6.25

CAST IRON WATER PIPE

Three to 20 in., Cleveland	$21.50
Twenty-four to 48-in., Cleveland	21.00
Four-inch, Chicago	26.00
Six to 12 inches, Chicago	24.00
Large sizes, Chicago	23.00
Six-inch, New York	20.00 to 20.50
Four-inch, Birmingham	19.50
Six-inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.70c to 1.80c
Steel bars, Philadelphia	1.65c to 1.70c
Steel bars, New York	1.80c
Steel bars, St. Louis	1.70c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, St. Louis	1.65c
Iron bars, Cincinnati	1.60c to 1.70c
Iron bars, Philadelphia	1.60c to 1.65c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.80c to 1.85c
Shapes and plates, St. Louis	1.80c
Shapes and plates, Philadelphia	1.65c to 1.70c
Shapes and plates, New York	1.85c
No. 10 blue anl. sheets, Chgo	1.95c
No. 10 blue anl. sheets, Cleve.	2.05c
No. 10 blue anl. sh., St. Louis	2.00c
No. 10 blue anl. sheets, Cinci	1.95c
No. 28 black sheets, Chgo	2.55c
No. 28 black sheets, Cleveland	2.45c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 black sheets, St. Louis	2.55c
No. 28 galv. sheets, Chgo	3.60c
No. 28 galv. sheets, Cleveland	3.50c
No. 28 galv. sheets, Cincinnati	3.40c to 3.55c
No. 28 galv. sheets, St. Louis	3.55c

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

No. 1 railroad wrought, Chgo	$ 9.00 to 9.25
No. 1 railroad wrought, Cleve.	9.25 to 9.75
No. 1 railroad wrought, St. L.	7.50 to 7.75
No. 1 railroad wrought, Cincin.	8.00 to 8.50
No. 2 railroad wrought, Chgo.	8.50 to 8.75
No. 2 railroad wrought, St. L.	7.50 to 8.00
Arch bars and transoms, Chgo.	12.00 to 12.50
Arch bars and transoms, St. L.	11.00 to 11.50
Knuckles, coup. & spr'gs, Chgo.	8.75 to 9.00
Knuckles, coup. & spr'gs, St. L.	8.50 to 9.00
Iron car axles	14.25 to 14.75
Shafting, Chicago	11.75 to 12.25
Shafting, St. Louis	11.00 to 11.50
Steel car axles, Chicago	11.25 to 11.75
Steel car axles, St. Louis	10.50 to 11.00
Locomotive tires, Chicago	9.00 to 9.50
Locomotive tires, St. Louis	8.50 to 9.00
Cut forge, Chicago	8.50 to 8.75
Pipes and flues, Chicago	7.00 to 7.25
Pipes and flues, Cleveland	7.25 to 7.50

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11.6 cents
Baltimore	14½ cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, (all rail)	80 cents
Pacific coast, via Panama canal	61 cents

Pipes and flues, St. Louis	5.75 to 6.25
No. 1 cast, Chicago	9.00 to 9.25
No. 1 cast, Cleveland	10.00 to 10.50
No. 1 cast, Cincinnati	8.50 to 9.00
No. 1 cast, St. Louis	9.00 to 9.25
No. 1 busheling, Chicago	7.75 to 8.25
No. 1 busheling, Cleveland	8.25 to 8.50
No. 1 busheling, Cincinnati	5.75 to 6.25
No. 1 busheling, St. Louis	7.50 to 7.75
No. 2 busheling, Chicago	6.75 to 7.25
No. 1 boiler plate, cut, Chgo	5.50 to 5.75
No. 1 boiler plate, cut, St. L.	5.50 to 5.75
Boiler punchings, Chicago	8.25 to 8.75
Cast borings, Chicago	5.00 to 5.50
Cast borings, Cleveland	6.00 to 6.25
Cast borings, Cincinnati	4.25 to 4.75
Cast borings, St. Louis	4.50 to 4.75
Machine shop turnings, Chicago	5.25 to 5.75
Machine shop turnings, Cleve.	5.50 to 6.00
Machine shop turnings, Cinci.	$ 4.25 to 4.75
Machine shop turnings, St. L.	5.00 to 5.50
Walleable agl., Chicago	7.50 to 7.75
Malleable agricultural, St. Louis	6.50 to 7.00
Malleable, railroad, Chicago	7.75 to 8.25
Malleable, railroad, Cincinnati	7.00
Malleable, railroad, St. Louis	7.00 to 7.50
Angle bars, iron, Chicago	11.25 to 11.75
Angle bars, iron, St. Louis	10.00 to 10.50
Angle bars, steel, Chgo	8.25 to 8.50
Angles bars, steel, St. Louis	8.25 to 8.50
Stove plate, Chicago	8.25 to 8.50
Stove plate, Cleveland	7.50
Stove plate, Buffalo	8.25 to 8.75
Stove plate, Cincinnati	6.50 to 7.00
Stove plate, St. Louis	7.25 to 7.50
Bundled sheet, Cincinnati	4.00 to 4.50

(Gross tons.)

Heavy melting steel, Pbgh	$11.75
Heavy melting steel, Buffalo	10.25 to 10.75
Heavy melting steel, Chgo	9.50 to 10.00
Heavy melting steel, Cleveland	9.75 to 10.00
Heavy melting steel, Cincinnati	9.00 to 9.50
Heavy melting steel, eastern Pa.	10.00 to 10.50
Heavy melting steel, New York	8.25 to 8.50
Heavy melting steel, St. Louis	9.50 to 9.75
Bundled sheet, Buffalo	7.00 to 7.50
Grate bars, Buffalo	9.00 to 9.50
Grate bars, New York	6.50 to 7.00
No. 1 railroad wrought, east. Pa.	11.50 to 12.00
No. 1 railroad wrought, Pbgh.	10.25 to 10.75
No. 1 R. R. wght., New York	9.50 to 10.00
No. 1 R. R. wrought, Buffalo	10.00 to 10.50
Shafting, New York	11.50 to 12.00
Shafting, eastern Pa.	13.50 to 14.00
Wrought pipe, New York	7.50 to 8.00
Wrought pipe, eastern Pa.	10.00 to 10.50
Mch. shop turnings, New York	5.75 to 6.25
Machine shop turnings, Buffalo	5.50 to 6.00
Mch. shop turnings, Pbgh	7.75 to 8.00
Mch. shop turnings, eastern Pa.	7.75 to 8.25
Cast borings, New York	5.75 to 6.25
Cast borings, eastern Pa.	7.75 to 8.25
Cast borings, Buffalo	6.00 to 6.50
Cast borings, Pittsburgh	8.25 to 8.50
Stove plate, N. J. points	8.25 to 8.50
Stove plate, Pittsburgh	9.00
Stove plate, eastern Pa.	8.50 to 9.00
Shoveling steel, Chicago	9.00 to 9.50
Shoveling steel, St. Louis	8.00 to 8.50
Reroll'g rails, 5 ft. & ov., Pbgh.	12.50
Reroll. rails, 5 ft. & ov., Chgo.	9.50 to 9.75
Reroll. rails, 5 ft. & ov., Cleve.	11.00 to 11.50
Reroll. rails, 5 ft. & ov., E. Pa.	10.50 to 11.00
Reroll. rails, 5 ft. & ov., St. L.	10.50 to 11.00
Steel rails, short, Chicago	9.50 to 10.00
Steel rails, short, Cleveland	11.00 to 11.50
Steel rails, short, St. Louis	9.50 to 10.00
Iron rails, Cleveland nom.	11.75 to 12.00
Iron rails, Chgo	12.00 to 12.50
Iron rails, Cincinnati	10.25 to 10.75
Iron rails, eastern Pa.	13.50 to 14.00
Iron rails, St. Louis	10.00 to 10.50
Iron rails, Pittsburgh	13.00 to 13.50
Frogs, switches, guards, Chgo.	9.25 to 9.50
Frogs, switches & g'rds, St. L.	9.75 to 10.25
Car wheels, (iron), Pittsburgh	10.50 to 11.00
Car wheels, (steel), Pittsburgh	11.50 to 12.00
Car wheels, Chicago	10.00 to 10.50
Car wheels, eastern Pa.	10.50 to 11.00
Car wheels, Buffalo	10.00 to 10.50
Car wheels, N. J. points	9.25 to 9.50
Car wheels, St. Louis	10.00 to 10.50
Iron axles, Pittsburgh	18.00 to 18.50
Iron axles, Cincinnati	19.00 to 20.00
Iron axles, eastern Pa.	18.50 to 19.00
Iron axles, Buffalo	16.00 to 16.50
Iron axles, Chicago	15.50 to 16.00
Steel car axles, New York	11.50 to 12.00
Steel car axles, Buffalo	12.00 to 12.50
Steel car axles, Cleveland	12.50 to 13.00
Steel car axles, eastern Pa.	13.50 to 14.00
No. 1 busheling, Buffalo	7.50 to 8.00
No. 1 busheling, Pittsburgh	9.75
No. 2 busheling, Buffalo	5.25 to 5.75
Low phosphorus steel, Buffalo	12.50 to 13.00
Low phosphorus steel, Pbgh.	13.00 to 13.25
Low phos. steel, eastern Pa.	13.50 to 14.00
No. 1 forge, eastern Pa.	7.75 to 8.25
No. 1 cast, eastern Pa.	11.75 to 12.25
No. 1 cast, Pittsburgh	11.75 to 12.00
No. 1 heavy cast N. J. points	11.00 to 11.50
Mall. iron, R. R., Cleveland	9.25 to 9.75
Malleable railroad, Pittsburgh	9.75 to 10.00
Malleable R. R., Buffalo	9.50 to 10.00
Malleable, R. R., east Pa.	8.00 to 8.50
Bundled sheet, Pittsburgh	9.00 to 9.25
Bundled sheet, Cleveland	7.50

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Malleable Iron CASTINGS
Of HIGH TENSILE STRENGTH and EXCEEDINGLY TOUGH *Large or small*, we are equipped to make your castings, and guarantee complete satisfaction It is our business to serve you. Quick delivery our specialty *Write us*
The General Malleable Company
WARREN, OHIO

Coke Recovered from Cupola Dump

(*Continued from page 382.*)

and sulphur, 0.759 per cent. Several pieces of this coke were placed on a fireclay cylinder standing upright. The coke rested on a screen, being heated by a blast lamp burning full blast for 1½ hours. The results obtained were similar to those in the first test, although in this case some of the ash was disturbed in the coke by the blast. The unburned coke contained 9.12 per cent ash and 0.686 per cent sulphur. The ash from the burned coke contained 0.135 per cent sulphur. Several other pieces of the coke were heated in the cylinder by a blast lamp for 2¼ hours and in this case the unburned coke contained ash, 9.72 per cent, and sulphur, 0.657 per cent. This shows a still greater increase in the ash and a corresponding decrease in the sulphur.

From these tests it is apparent that when coke is only partially burned, the unburned portion is higher in ash and lower in sulphur than the original coke. The ash will not fall off while the coke burns if undisturbed. Only 1 per cent of the sulphur in the coke remains in the ash, the rest passing off in gas. Whether any of this sulphur is absorbed by the iron and if so, what amount, can best be determined by work on a cupola in actual operation. However, if iron melted in a cupola increased in sulphur, it certainly must have taken it up from the coke, the limestone or from some other part of the charge.

Michigan Stove Co. Samples

The samples of coke received from the Michigan Stove Co. analyzed as follows:

Fresh coke—Moisture, 0.12 per cent; volatile matter, 0.77 per cent; fixed carbon, 91.43 per cent; ash, 7.68 per cent, and sulphur, 0.582 per cent.

Burned coke—Moisture, 0.15 per cent; fixed carbon, 91.07 per cent; ash, 8.78 per cent, and sulphur, 0.527 per cent.

Limestone nearly always contains some sulphur and this may have considerable bearing on the iron. The chemist ventured the opinion that it does so because much of the sulphur of the coke passes off in the gas in the form of sulphuric acid (SO_2), while the sulphur in the limestone present at CaSO, would probably be partly at any rate, if not entirely, reduced to CaS, which being non-volatile, would tend to come in contact with the molten iron and give up its sulphur to it.

Mine Accidents From Rock Falls

(*Continued from page 377.*)

hanging, ready to fall at the slightest jar. What applies in one mine may not apply to a mine of different type. In some mines ground that sounds solid when tapped may later come down in a mass without warning. In other mines a "drummy" (loose-sounding) piece of rock may stand for years, as it may be held or locked in place by the surrounding rock.

The usual method of spotting a dangerous piece of rock overhead is to tap the suspected place (gently at first) with a pick handle. Often almost any tool available is used. As a rule, rock that sounds "drummy" is not safe. Although such a piece of rock may not fall, the safest thing to do is to pull or gouge it down if possible. It is important not to stand under the suspected rock either when testing it or gouging it down. It is far better for the miner to spend as much as an hour if necessary in picking down loose rock than to take a chance of injury or sudden death.

When the miner has learned the nature of the ground

in the particular mine where he is employed, he will become familiar with the danger signs and the right way to detect bad ground.

Among other things, the underground boss should carefully inspect timbering and general conditions at working faces. In the matter of preventing accidents from falls he occupies a most important position. The records of a large mine that recently started an active safety campaign showed that most of the accidents in the mine were caused by falls, and that these falls were occurring chiefly in drifts and cross-cuts that were thought to be safe. In places where the ground was heavy it was found that few accidents occurred. This was because more care was observed in such places. This company arranged for closer inspection of working places and timbering, and for the use of more timber, especially in places where there was a doubt as to whether timber was necessary. The result of a six months' trial was a reduction of 50 per cent in the number of accidents from falls.

No comment is necessary on such work. It is an argument in favor of close inspection and the use of timber when in doubt. He should couple with this inspection prompt obedience to orders. When he tells a miner or mucker to pick down the back before going to work, arrange, if possible, to see that he does as he is told. Especially should this be done in handling inexperienced men. By the exercise of a little vigilance and care the boss can do much toward preventing injuries to his men.

Machines for Making Projectiles

(*Continued from page* 384.)

which prevents absolutely the tail-stock from slipping under heavy end thrusts. The principal dimensions of the lathes are as follows:

	20 inches.	24 inches.
Length of bed, feet	8	8
Takes between centers, feet	2	2
Swing over bed, inches	21	25
Swing over carriage, inches	11	13
Length of headstock on bed, feet and inches	3-7	3-7
Horsepower of motor	15	15
Number of speeds, spindle	60	60
Maximum r. p. m., spindle	350	350
Minimum r. p. m., spindle	12	12

Rutile Output in 1914

The only rutile produced in the United States during 1914, so far as is known to the United States geological survey, was, as heretofore, that put out by the American Rutile Co., at Roseland, Nelson county, Va. The company produced 94 tons of rutile carrying 95 per cent of titanium dioxide and as a by-product 89 tons of ilmenite carrying about 55 per cent of titanium dioxide. The sales included a quantity of rutile left over from 1913 equal to the production of 1914. The company did not operate its mill in 1914 until the middle of August. During the earlier part of the year the mill was thoroughly overhauled and new stamps and other machinery were installed. Large foreign orders could not be filled on account of the effect of the war upon commerce.

The rutile-bearing rock, which is termed a syenite by Dr. T. L. Watson, state geologist of Virginia, but which shows decidedly pegmatitic phases, is worked in open cuts by the company. Most of the rock worked came from a bluff near the mill, on the east side of Tye river, but some of the rock was also taken from the west side of the river. The rutile forms about 5 per cent of the rock worked.

Rutile is used in electrodes for arc lamps, for making ferro-titanium for use in cast iron and steel, in ceramics and chemicals. Concentrated rutile sells for $50 to $400 a ton, depending on quality, quantity and preparation.

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